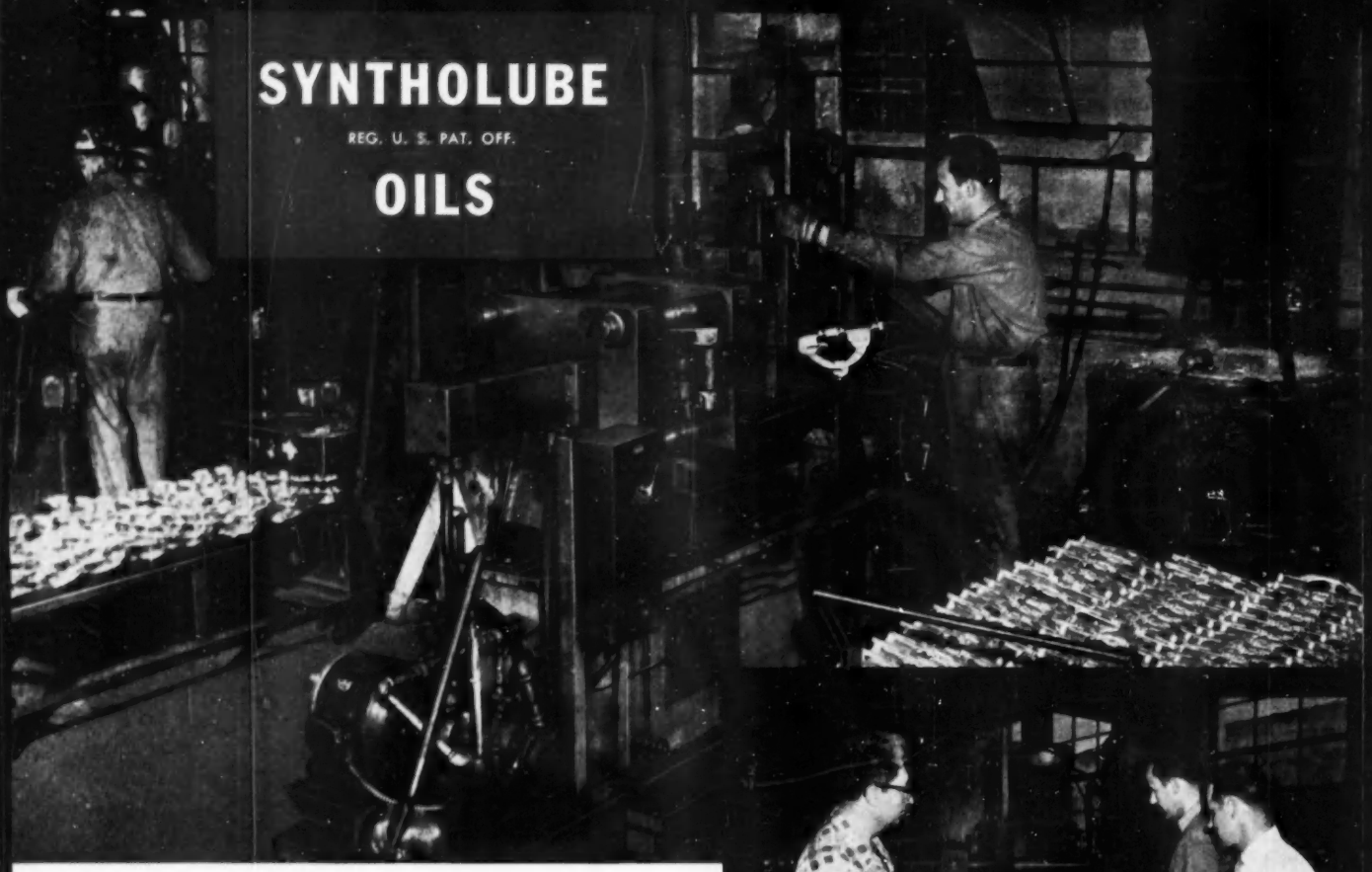
AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

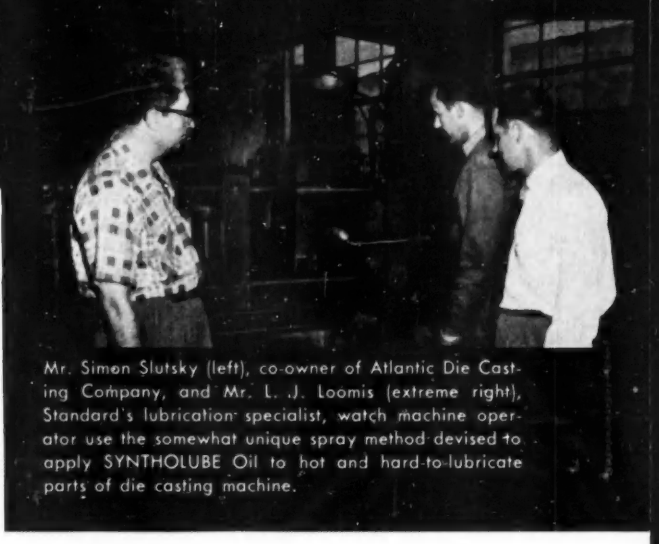
OCTOBER 1, 1954

In This Issue

A CHILTON PUBLICATION



Beats heat in die casting machines . . .



Mr. Simon Slutsky (left), co-owner of Atlantic Die Casting Company, and Mr. L. J. Loomis (extreme right), Standard's lubrication specialist, watch machine operator use the somewhat unique spray method devised to apply SYNTHOLUBE Oil to hot and hard-to-lubricate parts of die casting machine.

● The Atlantic Die Casting Company specializes in aluminum die casting. Using hydraulic machines of its own design, this company turns out amazingly intricate parts at a high rate of production. But it was not always easy going.

There had been a problem of lubrication. The exceedingly high temperatures necessary for die casting made it difficult to lubricate machine parts in the area of the heated dies. Various expensive and complicated lubricating mixtures were tried. Under the high temperatures, the lubricants thinned and did not cling well to the hot surfaces. Oxidation of the lubricants produced deposits. Resulting troubles: sticking of machine parts, particularly ejector pins; staining of aluminum castings, down-time for cleaning.

Consulted on this problem, a Standard Oil lubrication specialist recommended the lubricant that had been developed by Standard Oil for just such high temperature applications: SYNTHOLUBE Oil.

This unique product has made short work of the lubrication troubles. It does not "run" from hot surfaces. Its unusual depolymerizing characteristic has prevented the formation of troublesome deposits. In addition to other lubricating benefits, SYNTHOLUBE has eliminated the expense of using costly lubricating mixtures.

Whatever your lubricating problem or need, you'll find that a Standard Oil lubrication specialist has the engineering ability and the petroleum product to help you. You can reach the specialist serving your area of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 So. Michigan Ave., Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD *(Indiana)*

new engine equipped with...

COTTA TRANSMISSION repowers dragline at low cost!

Dragline operated by prominent Eastern city was repowered by Mack Boring and Parts Company, Newark, New Jersey.

When the utility of heavy capital equipment can't justify its replacement, as in the case of this municipal dragline crane . . . or when new equipment is difficult to get . . . rebuilding often gives you "like new" performance at low cost.

This prominent Eastern city modernized its dragline, adding years of trouble-free service life with a minimum capital outlay, by installing a new engine equipped with a Cotta, Model HMA, Heavy-Duty Transmission.

Cotta transmissions are designed for around-the-clock, efficient operation on original equipment or replacement applications such as cranes, drillers, locomotives, shovels, generators, pumps and other heavy-duty machinery.

Engineers specify Cotta when they want extra "beef" . . . when heavy, intermittent operation shocks gears and overloads shafts, keyways and bearings . . . and when costly repairs and down-time must be eliminated.

When heavy equipment requires a low cost power transmission, reduction unit or gear case with these "rugged" characteristics "built in," Cotta engineers will help select the right unit to give you outstanding performance.

Designed For

A Broad Range of Ratios

And Input Torques

From 150 to 2000 Foot Pounds

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

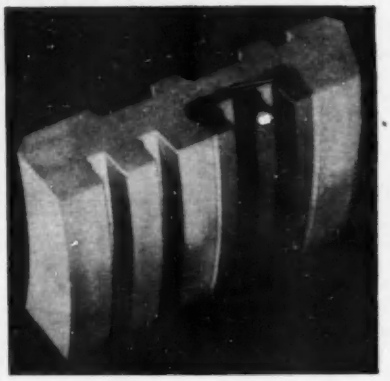
An Assurance of Dependable Service

COTTA

HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"

A Ni-Resist Ring Band is an integral part of this forged aluminum piston for Nordberg 11- and 12-cylinder Radial engines. Sectional view indicates the relatively small amount of Ni-Resist needed for the insert which is bonded to the aluminum alloy.



Ring bands of NI-RESIST in aluminum pistons

Increase Output...Cut Maintenance

A major problem with engines equipped with aluminum alloy pistons is the high rate of wear that tends to occur in the ring area.

Wear is particularly severe in the top ring groove, which is exposed to the most heat, receives the least lubrication and is attacked by abrasive dust and dirt coming through the intake. "Blow-by" caused by excessive ring groove wear in the aluminum piston means loss of power and increased oil consumption.

There's one answer to these troubles. Wear resistance . . . the answer given by aluminum alloy pistons with ring bands of NI-RESIST®. The high expansion properties of Ni-Resist prevent warping and failure of the joint between the two metals.

You will find it pays to specify aluminum pistons with Ni-Resist ring bands in all heavy-duty engines for truck, bus, locomotive, marine and aircraft, as well as stationary power plant use.

Performance records show increased power per cylinder as well as improved piston life, because Ni-Resist defeats heat, corrosion, metal-to-metal wear and galling. Under current trends to raise engine output by increasing temperatures and using chemically treated fuels, the advantages offered by Ni-Resist mean extra engine economy. A truck fleet operator reports an average of 250,000 miles per set with this type of piston in his vehicles.

Consider Ni-Resist for many other engine applications. These include exhaust valve guides, exhaust seat rings and ball joints, exhaust manifolds...cylinder liners ...connector rings, water pump impellers and bodies.

Several types of Ni-Resist are available to meet a variety of industrial demands. In fact, no other cast metal provides such a useful combination of engineering properties. Get full information ... mail the coupon now.

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.
Please send me booklets entitled "Engineering Properties and Applications of Ni-Resist" and "Buyers' Guide for Ni-Resist castings."

Name_____

Title_____

Company_____

Address_____

City_____ State_____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

OCTOBER 1, 1954 VOL. III, NO. 7

FEATURES

NEWS PREVIEWS

DEPARTMENTS

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1903; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

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"PRODUCTION INCREASED BEYOND EXPECTATIONS"

—says
M. A. Enright, Vice President,
Nelson Stud Welding Division,
Gregory Industries, Inc.,
Lorain, Ohio.

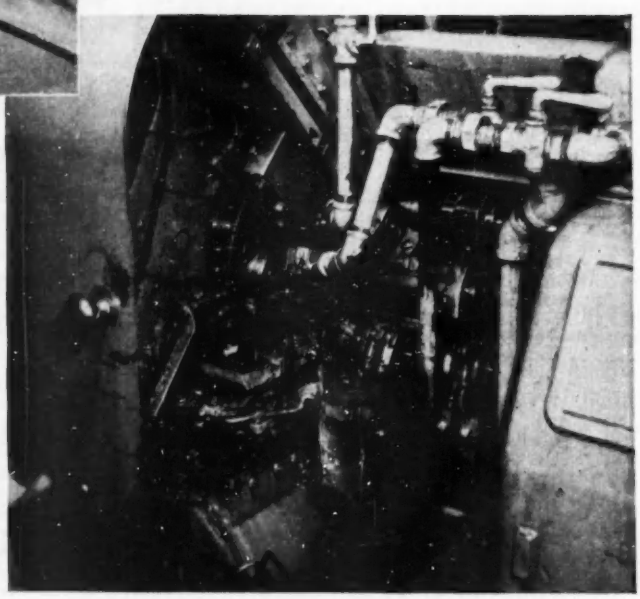
SEMI-AUTOMATIC NELWELD gun developed for controlled welding of flux-filled studs helps cut costs in every metal using field. Studs produced in many shapes and sizes are used to hang, hold and handle.

IN manufacturing studs for end welding," says Mr. Enright, "we have to choose materials for weldability and service, regardless of their machinability. This sometimes presents serious production problems. After testing a number of soluble and cutting oils over a period of years, we have found that *Texaco Transultex Cutting Oil,* recommended by Texaco Lubrication Engineers, reduces such problems to a minimum.

"Since changing to *Texaco Transultex Cutting Oil,* our production has increased beyond our expectations, and maintenance costs have been substantially reduced."

The above experience is typical. Whatever the machining to be done, whatever the machines used or the metal to be cut, there is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do it better, faster, and at lower cost.

A Texaco Lubrication Engineer will gladly give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

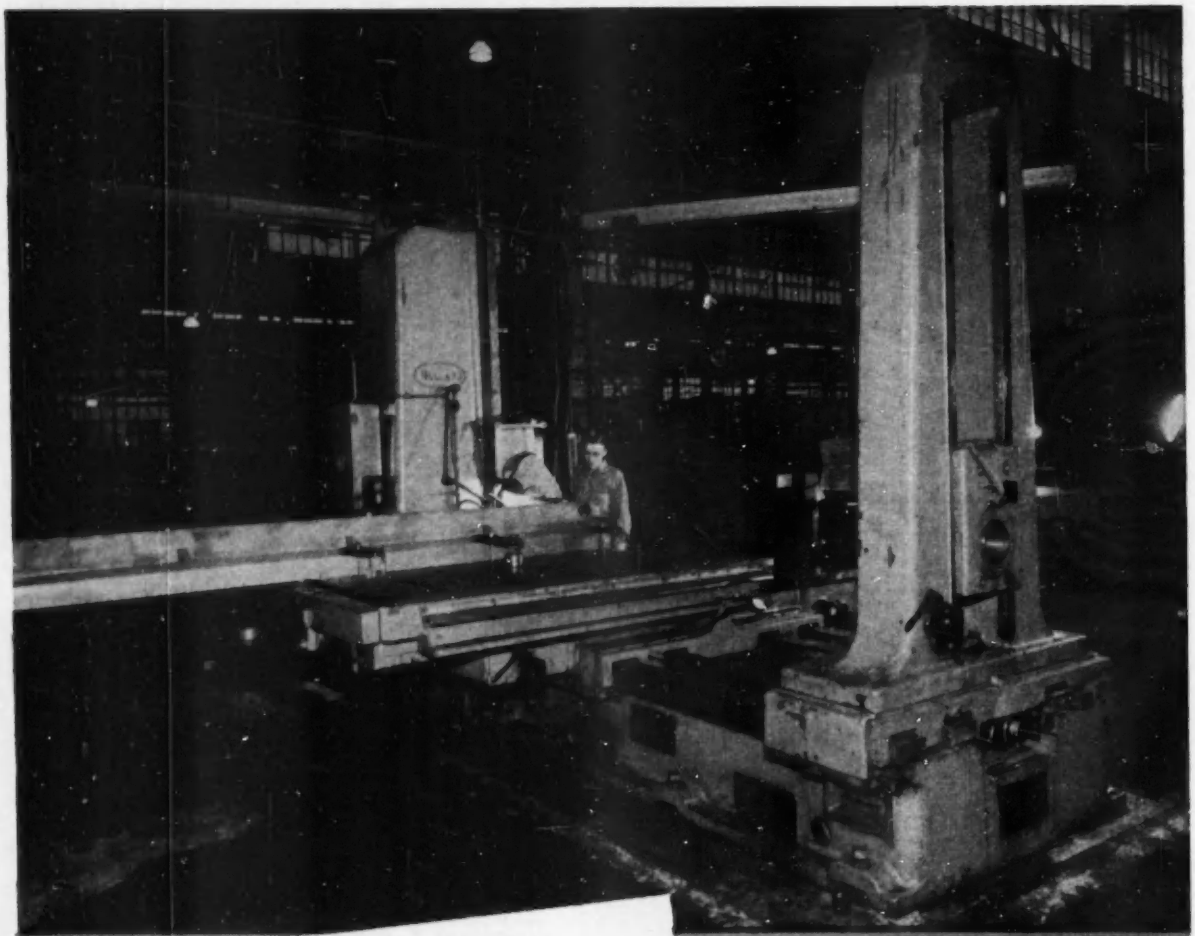


NELSON USES a battery of National Acme multiple spindle automatics, Brown & Sharpe single spindle automatics, and many Nelson Vertical single spindle automatics for threading and boring its end welding studs. Various kinds of stainless and 1015 to 1020 steels are used. Coolant is *Texaco Transultex Cutting Oil.* Machine lubricant is *Texaco Cleartex Oil.*

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television . . . Saturday nights, NBC.

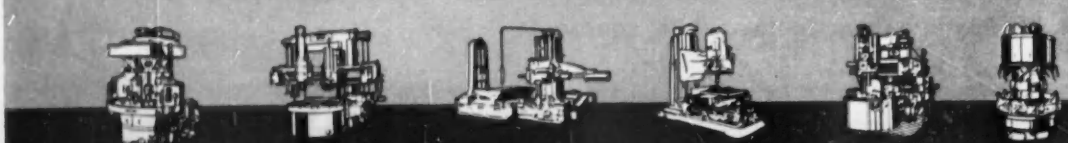


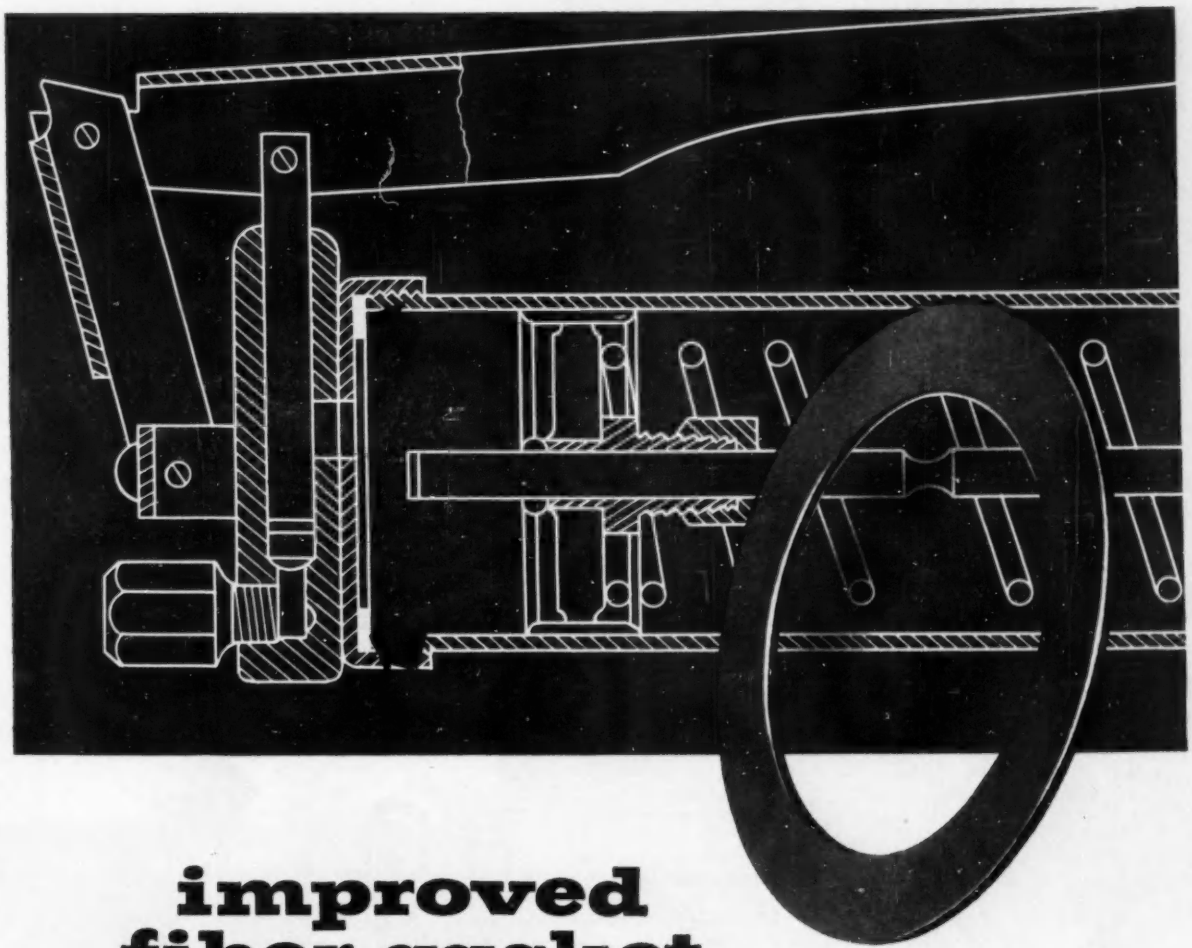
. . . REPLACEMENT *Strategy* . . . BULLARD . . . .

FOR OUTMODED MACHINES

With keener competition and manufacturing costs increasingly important, new products, methods, materials and cutting tools have made it necessary to revaluate standards of present day procedures. Modern tools such as the Bullard Horizontal Boring, Milling and Drilling Machines are designed and built to give you full advantage of these modern developments insuring maximum performance, accuracy and dependability for years to come.

Ask your Bullard representative to call and explain its application to your work or write to





improved fiber gasket

resists cutting action of sharp, narrow flange

Assembly methods may sometimes cause difficulty with gasket materials that are otherwise satisfactory. A good example is found in the experience of a manufacturer of lever-type lubrication guns.

In these guns, the grease cylinder is screwed into place against the gasket in the head assembly. In effect, the turning action makes the end of the tubing a circular knife. Ordinary gasketing material could not withstand the cutting action of the sharp, narrow edge—and the guns leaked.

The manufacturer found an effective, economical solution in an improved fiber gasketing material—Armstrong's CN-705 Accopac®. This highly compressible, crush-resistant material did not cut or tear on assembly, sealed the gun tightly.

Accopac's ability to seal very narrow flanges is a result of the way it's made. Fiber, cork, and rubber are blended into an unusually compressible material by a patented beater saturation method. The sheets formed from this material are homogeneous, uniformly strong, and highly resistant to dimensional change.

When you want an unusually compressible and stable fiber gasket material—try Accopac. Already performance-proved in pumps, air compressors, aircraft devices, automotive equipment, and appliances, Accopac may well be your best bet wherever you need dependable, low-cost sealing.

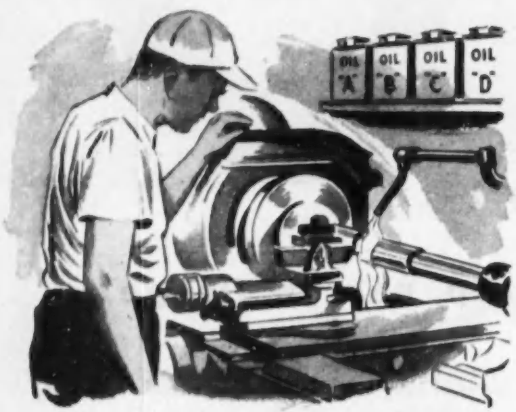
FREE 24-PAGE GASKET MANUAL—See "Armstrong's Gasket Materials" in Sweet's product design file . . . or write for your personal copy to Armstrong Cork Company, Industrial Division, 7010 Imperial Avenue, Lancaster, Pennsylvania. **Be sure to specify Armstrong's Gasket Materials when you order from your gasket fabricator.**

ARMSTRONG'S ACCOPAC

How to Pick the Right Cutting Oil

WORD OF MOUTH?
It gives you the answer sometimes, but not many of your friends have the same cutting oil requirements and the same problems that you have. It's much surer to depend on specialists like Sun.

LABORATORY ANALYSIS?
Sure. But there's no formula for correlating the laboratory analysis with how well the cutting oil will work on your job. It takes years of field experience like Sun's to help you make the right choice.



ELABORATE SHOP TEST?
This will probably give you the answer. But it's expensive and interferes with production when you try to test all the oils available. Sun's experience can help keep your shop-testing to a minimum.

EXPERIENCE IS THE ANSWER.
And Sun has it. Its field representatives have probably come across problems similar to yours many times. If they haven't, its cutting oil specialists and metallurgical technicians are ready to help with your problem.

Soluble or straight, transparent or black, light or heavy duty — Sun makes the kind of cutting oil you need to handle your job at the lowest cost. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-10.

INDUSTRIAL PRODUCTS DEPARTMENT

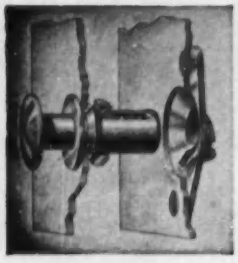
SUN OIL COMPANY

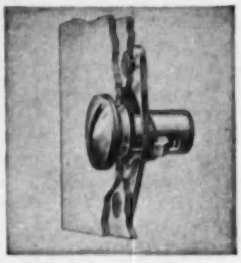
SUNOCO

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

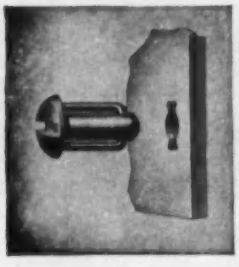
Refiners of famous High-Test Blue Sunoco Gasoline

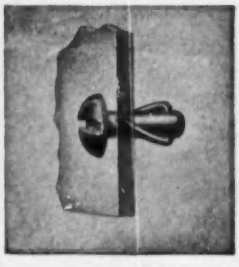
3 ways to save on assembly costs



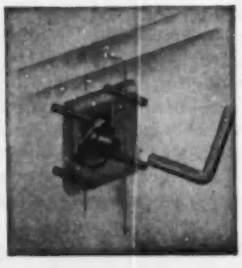


QUICK-LOCK For fastening removable access doors and panels. Because of its ease of installation, QUICK-LOCK is ideal for assembling removable panels. A 90° turn locks it in place. Stud is self-ejecting when unlocked; visual inspection shows whether fastener is locked. Spring loading takes initial load; solid supports carry increased load. Available in a wide range of sizes.





SPRING-LOCK One-piece fastener for blind holes has load-carrying steel spring wire. Spring steel arms lock fastener securely, prevent loosening under vibration. SPRING-LOCK will work with varying panel thicknesses, locks with a twist of the wrist. SPRING-LOCK is now available in high-impact plastic. The molded design permits heads to be made in various shapes for refrigerator shelf supports, washer knobs, brackets. Available in a wide variety of shapes and sizes, and also in custom designs.



ROTO-LOCK Serrated, tapered cam is engaged by formed lug as fastener is locked. Cam action draws panels together tightly, insures locking even under conditions of misalignment. Opens easily for demounting. ROTO-LOCK carries heavy tension and shear loads; can be used for air and water-tight seals; recesses completely into panels. Solidly built without springs or delicate mechanical parts, unaffected by arctic temperatures or field service.

Simmons

QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

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If you are interested in cutting your costs, turn to Simmons Fasteners—the fasteners with *uses unlimited*. Write for samples and catalogs today.

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- **Completely automatic cycle** — High speed approach, wheel feed spark out and withdrawal are positively controlled through simple cam action — ensuring constant, uniform operation under all conditions.
- **Automatic positive size control** — The wheel slide is held against positive stops with uniform hydraulic pressure.
- **Automatic trueing device** with controlled dressing.
- **Automatic or manual handling.**
- **Complete versatility** — chucking work, center work or shoe-type grinding; crush wheel or diamond trueing.
- **Compact design** — affords exceptional accessibility and simple set-ups.

Write for illustrated folder — gives complete specifications and examples of how the Model "E" does jobs faster, better and more economically.

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What variables do you need to measure? This family of instruments covers temperatures, pressures, flow, frequency, power and practically everything that anyone would want to know about to supervise a process.

What accuracy do you require? Honeywell offers you a full selection, ranging from high-precision *ElectroniK* instruments to relatively simple protective devices.

Need control? You can choose from a line that extends from self-contained valve controllers small enough to hold in your hand, to complex graphic panels that regulate a complete manufacturing plant.

Instrumentation by Honeywell means a single responsibility for your complete control equipment . . . coordinated engineering, production and delivery. It gives you the important plus values of simplifying the training of your instrument maintenance men, and of minimizing your maintenance parts stock problems. And because this line is so complete, the instrumentation recommended for your application is selected without bias . . . needs no stretching or squeezing . . . represents the best combination of performance and economy for its intended job.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

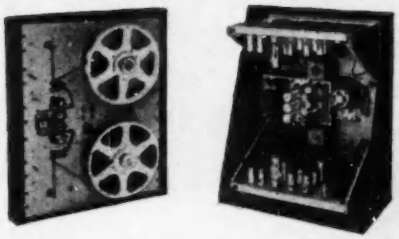
BROWN INSTRUMENTS

First in Controls

● REFERENCE DATA: FOR A QUICK LOOK AT THE COMPLETE HONEYWELL LINE, WRITE FOR COMPOSITE CATALOG NO. 5001

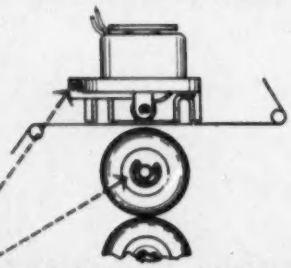
30 Waldes Truarc Rings Save Space and Time... Simplify Assembly and Disassembly

Potter's New Digital Magnetic Tape Handler



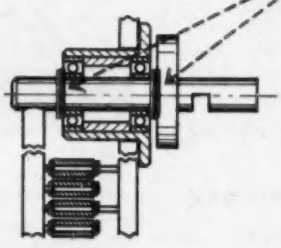
■ Prime requirements: fast starts, fast stops, fast tape speeds, great accuracy. Using Truarc rings, this new model starts and stops the tape within 5 milliseconds, has tape speeds up to 60 inches per second.

Solenoid Mount and Capstan Assembly



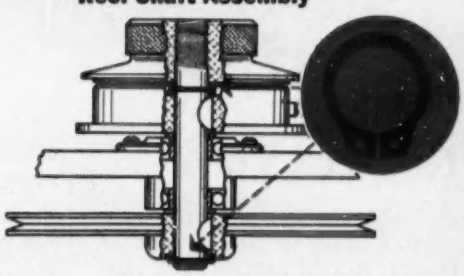
■ Miniature Truarc E-Rings on .040 diameter shaft and on continuously running capstans eliminate projecting bolts and screws. Rings permit rapid assembly and disassembly, fast replacement of worn rubber capstans.

Tension Shaft Assembly



■ Truarc E-Rings snap quickly into place, act as shoulders for the ball bearings with a minimum of friction. Additional Truarc Rings are used as spacers on shafts, can be located accurately to extremely close tolerances.

Reel Shaft Assembly



■ Truarc Standard Rings (Series 5100) hold the reel shaft assembly firmly in place and permit the use of quick-lock hubs so that the reel tapes can be changed in seconds as they are finished.

Potter Instrument Company, Inc., of Great Neck, L. I., uses 30 Waldes Truarc Retaining Rings in their new Model 902 High Speed Digital Magnetic Tape Handler. In addition to solving a variety of fastening problems, Truarc Rings facilitate the rapid acceleration and fast stopping needed in these machines.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble. They save time and increase operating efficiency.

Find out what Waldes Truarc Retaining Rings can do for you, toward saving costs and improving your product. Send your blueprints to Waldes Truarc Engineers for individual attention without obligation.

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WALDES TRUARC

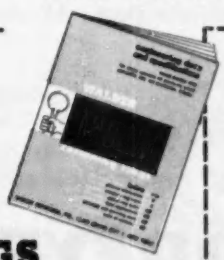
REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,362,947, 2,392,940, 2,410,052, 2,420,021, 2,420,341, 2,439,785, 2,441,846, 2,458,155, 2,483,380, 2,483,383, 2,487,602, 2,487,603, 2,491,306, 2,509,081 AND OTHER PATENTS PENDING

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



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Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N.Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

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Name .....

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No Need To!

Bringing the parlor to the open road was once the height of luxury. But in today's sleek new cars, sofa-like seats—for all their new springing and styling – are hangovers from the past. They're out of key with modern production economies, out of line with modern space requirements, out of step with modern tastes—*and completely unnecessary!*

Why? Because AIRFOAM is not "just another" cushioning material. It's a new way to design interiors! AIRFOAM creates production short cuts all its own, replaces costly and bulky springings, makes the smartest custom effects simple premolding operations!

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Design-wise, production-wise, you'll be way ahead—once you use AIRFOAM for what it is—a *new* material with *new* and unique advantages to be exploited in *new* and exciting ways!

That is precisely what today's most successful *furniture* manufacturers are doing. Should the automotive industry be far behind?

AIRFOAM design engineers are right at your elbow. Write or phone Goodyear, Automotive Products Dept., Akron 16, Ohio.

AIRFOAM *saves precious space! More headroom—more footroom—without enlarging body!*

AIRFOAM *imparts custom looks at mass-production cost!*

AIRFOAM *makes exciting new seating ideas practical!*

AIRFOAM *can give you a sales-building lead on the field!*

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"Our Baldwin FGT SR-4® testing machine is invaluable!"

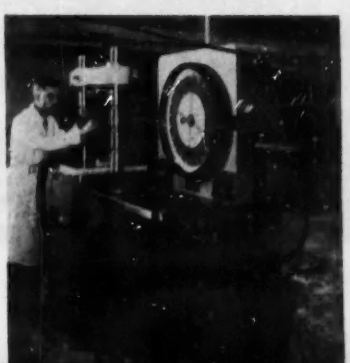
"We don't have 'routine' production line tests . . . each test we get is likely to be entirely different from any we've run before," explains the Engineering Test Group of Lockheed Aircraft's Engineering Test Laboratory, Marietta, Ga. "That's why the new Baldwin-Emery FGT SR-4 Universal Testing Machine fits our needs so well. This single revolutionary machine is not only easy to operate and extremely accurate, but is flexible as well."

These photographs show just two of the diverse tests Lockheed is making on their 50,000 pound FGT machine . . . the closeup shows a round piece of aluminum stock being tested with the Baldwin SR-4 Extensometer added for accurate control . . . the smaller picture shows how Lockheed obtains the ultimate adhesion strength of a metal-to-metal bond within very accurate tolerances.

Your laboratory, too, will profit by using this unique, versatile testing machine . . . for any of these diverse tests; static tension, compression, flexure, torsion, creep, stress rupture, relaxation, or even shock tests on structures. For the full story on this example of Baldwin's "Packaged Precision Measurement," write us for our new Bulletin 4206. Address: Dept. 2404, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

See the FGT in action at Baldwin's Booth 1065, 36th National Metal Congress & Exposition, International Amphitheatre, Chicago, November 1-5.

BALDWIN BLH LIMA-HAMILTON

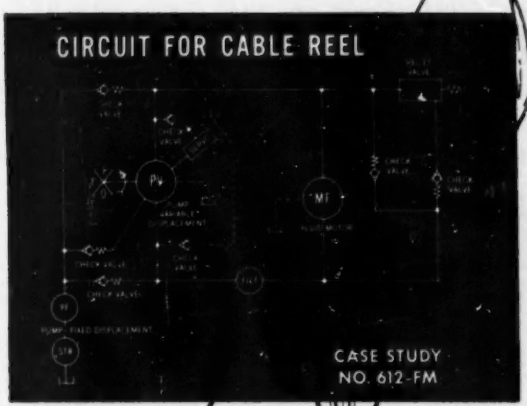


TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. Offices in Principal Cities
In Canada: Peacock Bros., Ltd., Montreal, Quebec

Shock loads can't hurt this fluid motor



Denison Axial Piston Fluid Motors recommended for the toughest jobs . . . without qualification

● Quick starts, quick stops, stalling under load, continuous braking. These are the kind of conditions Denison Fluid Motors are built for. Where other motors fail, Denison hydraulic motors operate continuously . . . in conveying equipment, mining, drilling, construction machinery.

Through efficient axial piston design, Denison hydraulic motors pack high horsepower, high torque in a smaller space. The 400 series fluid motor is less than a foot long, weighs only 40 pounds . . . yet delivers 24 horsepower.

Denison Fluid Motors can be furnished to develop up to 180 horsepower, 5665 pounds-inches torque . . . for any hydraulic circuit to 5000 psi.

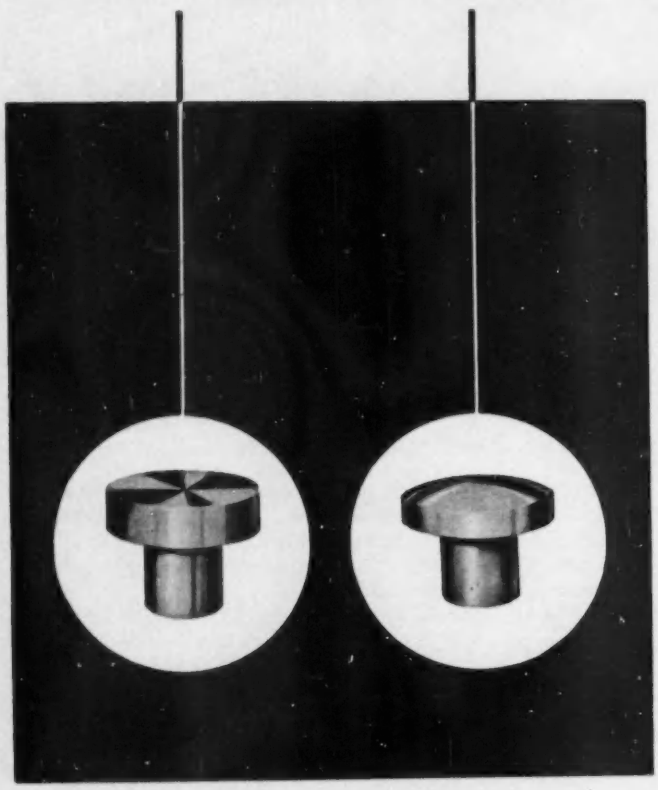
The circuit shows a Denison Fluid Motor that reels cable in and out of oil wells. For bulletins about Denison Fluid Motors, write to: THE DENISON ENGINEERING COMPANY, 1212 Dublin Road, Columbus 16, Ohio.

PUMPS • MOTORS
CONTROLS • PRESSES

DENISON
TRADE MARK
*Hydr*OIL*ics*

IMMEDIATE DELIVERY!

MALLORY STANDARD STOCK Silver Rivet Contacts



ORDERING fine-silver headed rivet contacts? First, check through the list of standard stock Mallory types and sizes. Out of the 70 different sizes and styles of contacts that Mallory carries in stock for immediate shipment, you'll probably find one that fits your exact requirements.

By using standard stock Mallory contacts, you can save time and money in several ways:

SAVING: in time and cost of special designs and tooling.

QUICK SHIPMENT: orders from stock are usually shipped within 24 hours.

SAMPLES: immediately available, where necessary.

SMALL QUANTITIES for pilot runs and job orders are delivered promptly.

Mallory's contact standardization program was the result of an intensive survey of thousands of customer prints and usage records. From an analysis of these, 70 sizes were selected which match the great majority of applications for fine-silver headed rivet contacts, in both flat and radius-faced designs.

Dimensions, part numbers and prices of Mallory stock contacts are listed in a new folder. Write for your copy today . . . and use it as a "preferred list" for present and future specifications.

Special Contacts

If unusual requirements call for a contact outside of the standard list, Mallory engineers are well qualified to recommend a specialized contact design. At your service are Mallory's wide range of contact materials, and efficient facilities for manufacturing contacts and complete contact assemblies.

Expect more . . . Get more from MALLORY

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Caterpillar

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. . . in one time-cycle . . . on a single machine . . . and faster

JOB FACTS:

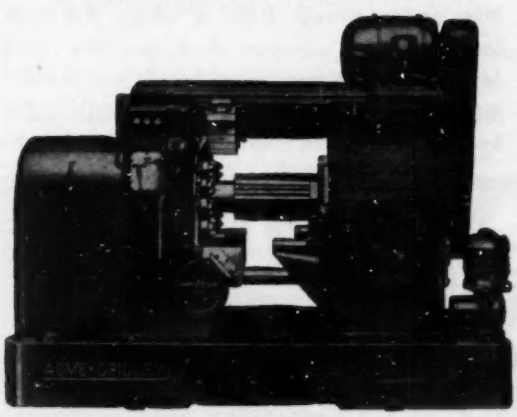
PART—Track Roller Bushing
SIZE—4¼" diam. x 3¾" long
MATERIAL—Cast Iron
OPERATIONS—23, Carbide Tooling
MACHINE TIME FOR ALL OPERATIONS—3 Minutes
10 pieces per hour

CATERPILLAR Tractor Company is the world's largest producer of crawler type tractors. As they grow bigger each year, they specify larger heavier, more costly automatic machines—in this case a 20-ton, 8-spindle hydraulic chucker, for repeated runs on the part illustrated as well as others.

A fair question to ask is "Why the investment, why not do the job the single spindle way, or on 4-spindle automatics—why use 8-spindles?"

Plainly because they know the value of man-hours and floor space—have long since proved through comparison of actual cold cost production figures that the lowest machining costs yet possible are obtained by 2-at-a-time planning with

ACME-GRIDLEY 8-SPINDLE AUTOMATIC CHUCKING MACHINES



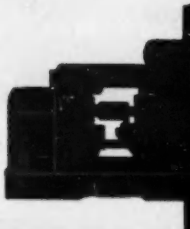
8 SPINDLE 8" ACME-GRIDLEY CHUCKER— built also in 4 and 6 spindle models and in sizes 5¼" to 12".

Here's how they do it...

• the advantages are basically 3...and they interlock—

1. **MORE SPINDLES**—with double index to finish both ends of the piece at the same time—more tools with one machine, one operator and in a cycle time that is always controlled.
2. **BROADER BASE**—adaptability to similar jobs—through interchangeability of tools, attachments, cams and gears—reducing the change-over costs and inventory.
3. **EXPERIENCE AT SOURCE**—Caterpillar knows that Acme-Gridley basic design, stamina and tool engineering to solve new problems are dependable—never let you down.

This is just another example among thousands based on our 55 years since we produced the first "multiple." Maybe your chucking problems are simpler, which makes it easier for you and for us. Why not find out, anyway?

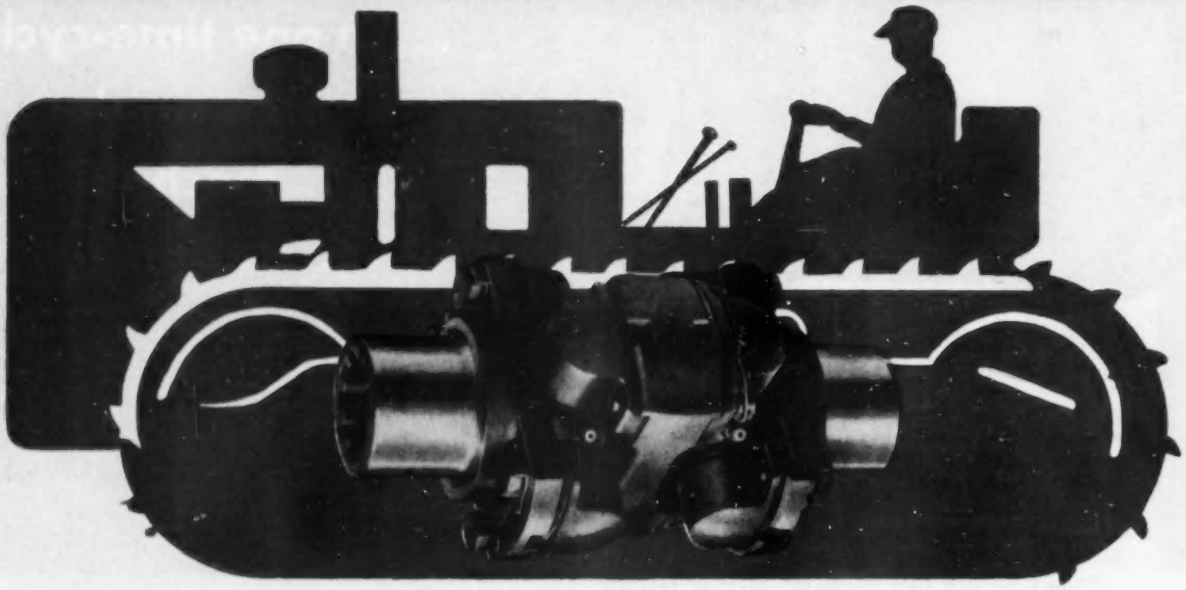


The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

FLEXIBLE



Modern Crawler tractor design requires a F-L-E-X-I-B-L-E connection between the engine and transmission. MECHANICS Close-Coupled Type UNIVERSAL JOINTS not only provide for high angularity within cramped space but compensate for out-of-alignment conditions. The shocks and strains that crawler tractors encounter in heavy duty work often are so great that they temporarily twist the tractor frame. MECHANICS Close-Coupled Type UNIVERSAL JOINTS are designed to provide the F-L-E-X-I-B-I-L-I-T-Y needed to make efficient operation possible under such adverse conditions. MECHANICS exclusive KEY method of driving has the highest safety factor, transmits the most torque, and averts costly breakdowns that result from driving through bolts or screws that work loose. Let our engineers show you how these MECHANICS advantages will benefit your product.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Ave., Rockford, Ill.

MECHANICS

Roller Bearing BW

UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery • Aircraft • Tanks • Busses and Industrial Equipment

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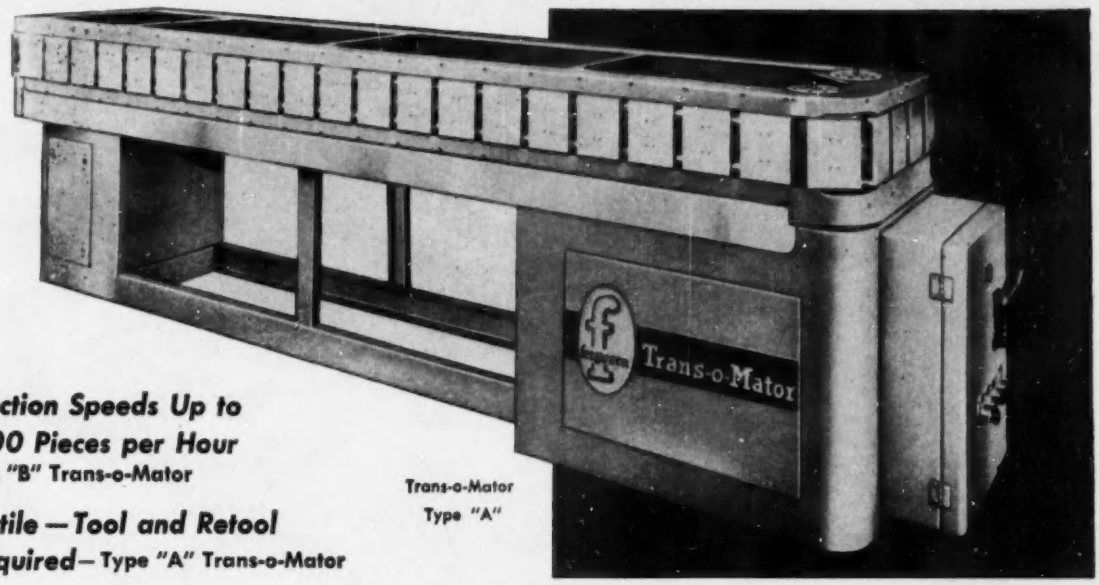
THE STANDARDIZED PRODUCTION TOOL FOR YOUR AUTOMATION PROGRAM...

The New FERGUSON Trans-o-Mator!



Trans-o-Mator
Type "A"

Production Speeds Up to 20,000 Pieces per Hour
— Type "B" Trans-o-Mator

***Versatile — Tool and Retool as Required*— Type "A" Trans-o-Mator**

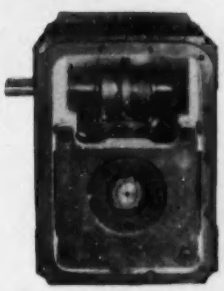
Mechanize Your Manual Operations — Increase Production Rates of Automatic and Semi-Automatic Operations . . .

Increase production, save manpower, improve product quality and cut design time with the new FERGUSON Trans-o-Mator . . . a versatile, standardized, multiple station transfer machine adaptable to many automatic assembly functions in your production operations.

The Trans-o-Mator includes a complete power transmission unit and electrical control panel. Add whatever tooling is required to perform light machining, forming, pressing, assembling and inspection operations and you have a standardized production implement, tailor-made for your application.

The Type "A" Trans-o-Mator is designed for versatility of operations in the automotive and other industries where product design changes necessitate retooling. It provides for the widest possible range of assembly operations, inspections, measurements and testings at production rates up to 6,000 pieces per hour. The Type "B" Trans-o-Mator is a high speed unit for the paper converting, electrical manufacturing, packaging and other industries where production rates as high as 20,000 pieces per hour are essential and low product costs are critical.

The success of your Automation Program — the conversion from manual to mechanical operations — depends almost entirely upon such factors as the versatility, simplicity, speed and ease of maintenance of your production machinery . . . upon just those characteristics designed into the FERGUSON Trans-o-Mator . . . so discover how the Trans-o-Mator can be applied to modernize your production lines, how it will save you money . . . even paying for itself and showing a profit within a year's time! Send for complete information today.



WITH THE FAMOUS FERGUSON ROLLER GEAR DRIVE FOR HIGH SPEED PRECISION INDEXING

WRITE FOR INFORMATION — NO OBLIGATION

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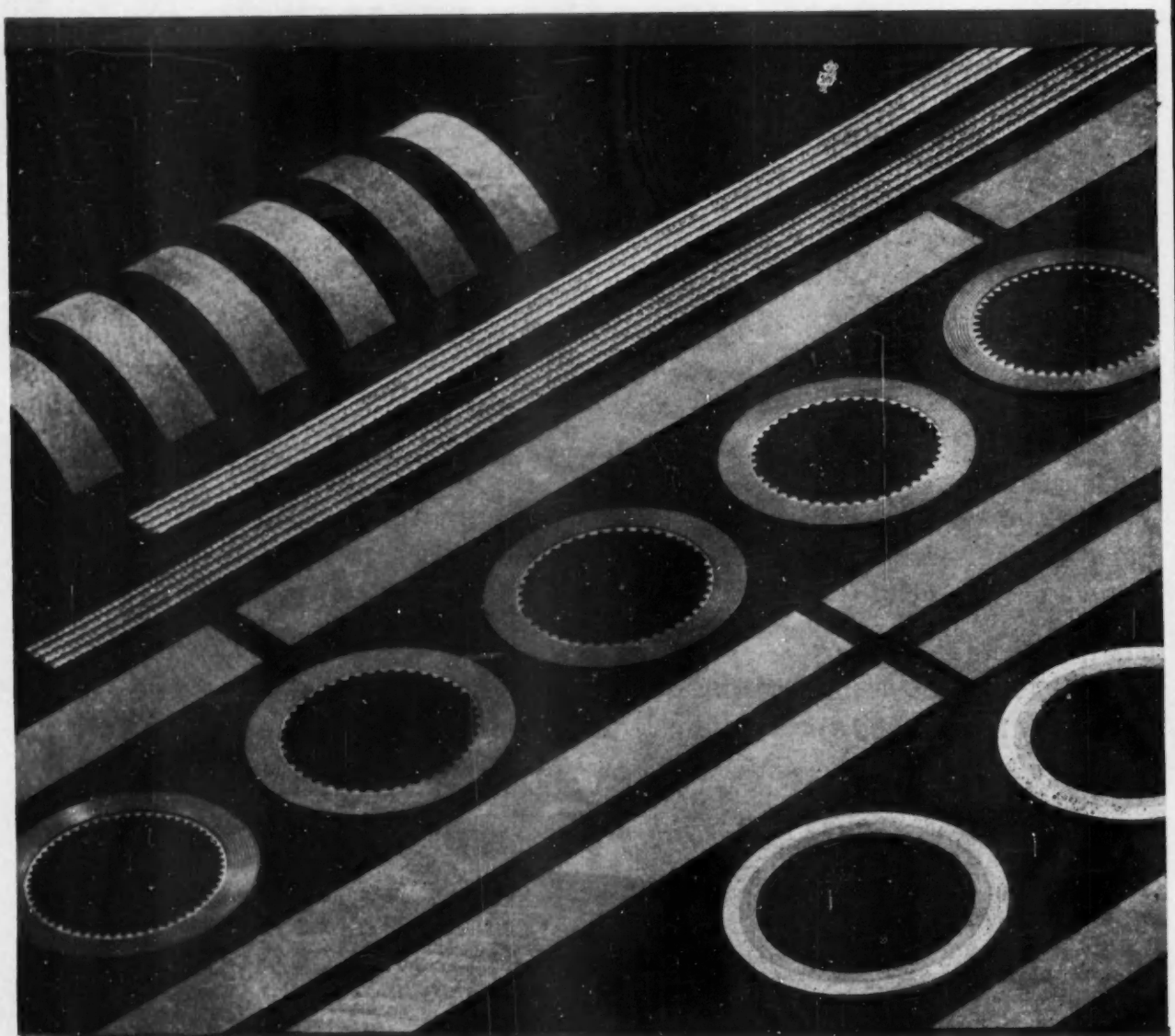
ROLLER GEAR DIVISION, DEPT. AT-10 P. O. BOX 191, ST. LOUIS 21, MO.

Manufacturers of the Ferguson Trans-O-Mator, Ferguson Roller Gear Drives, Dial Feed Index Tables, Roll Feeds for Presses, Special Cams, Special Purpose Machinery.

All passenger car automatic transmissions



R/M

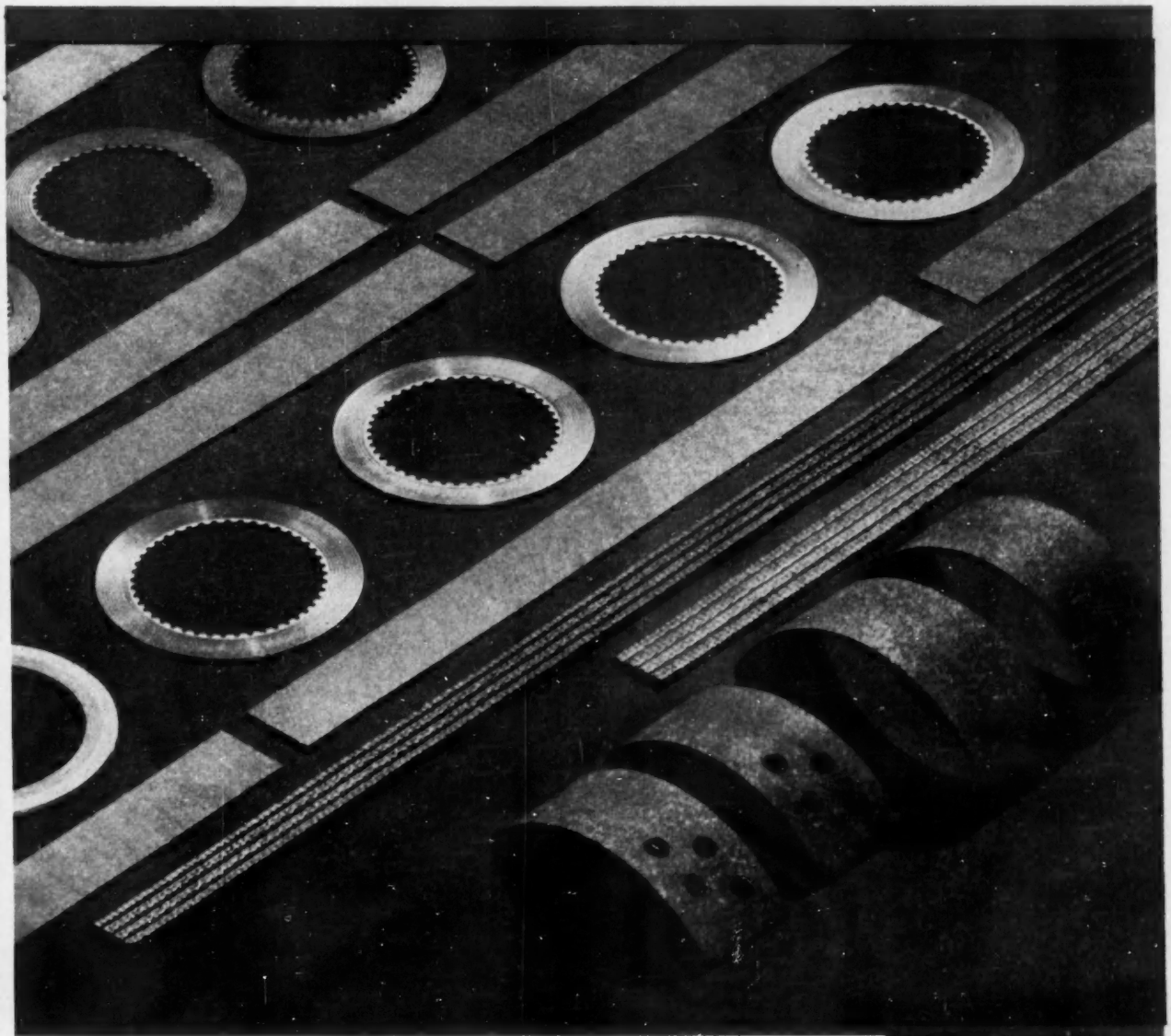
When the first automatic transmission was designed, Raybestos-Manhattan pioneered the development of the friction materials. Today, *every* model of full or semi-automatic transmission for passenger cars (many trucks, too) is equipped with one or more R/M friction products—sintered metal, semi-metallic, woven, molded, cork-cellulose. Only R/M makes all such parts.

R/M's 50-odd years of "know-how" is yours for the asking, no matter what type of equipment you make. Just tell us what your friction material problem is. We'll recommend those materials that suit your requirements best. Call in your R/M representative. Take full advantage of R/M's experience and the facilities of seven plants, with their research and testing laboratories.

Write for new R/M Bulletin No. 500 . . . just off the press! Its 44 pages are loaded with practical design and engineering data on all R/M's friction materials.

THE TRADE-MARK THAT SPELLS PROGRESS

have one or more R/M FRICTION PARTS



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RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Fan Belts Radiator Hose • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Rubber Covered Equipment • Asbestos Textiles • Packings • Abrasive and Diamond Wheels • Bowling Balls

R M

FIRST IN FRICTION

IN FRICTION MATERIAL DEVELOPMENT

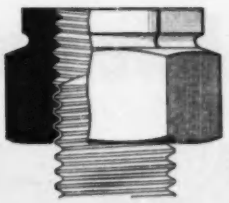
This portable electric hammer is completely self-contained. So are the one-piece, all-metal FLEXLOCs that hold it together, even under the intense impact vibration induced by the rapid hammering action.

FLEXLOCs chosen to withstand vibration of 3000 hammer blows per minute

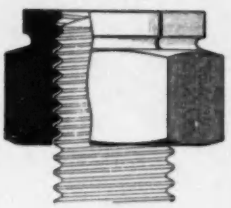
The manufacturer of this portable electric hammer reports, "FLEXLOC Self-Locking Nuts have solved our problem of obtaining a desirable fastener, because they withstand the terrific vibration induced by the impact of 3000 hammer blows per minute without working loose."

This portable electric hammer is subjected to terrific impact-induced vibration. The fasteners that hold it together must take the same beating. The FLEXLOCs were selected only after numerous fastening devices had been tested. Two ¼"-20 nuts hold the fastening bolts securely in position on the forward end of the hammer. One 1"-14 nut prevents loosening of the components at the nose.

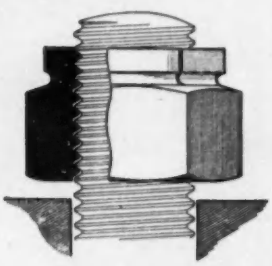
You can get FLEXLOCs of various types and materials in a wide range of sizes and in any quantity. And these one-piece, all-metal locknuts are carried in stock by leading industrial distributors everywhere. See your FLEXLOC distributor or send for literature and samples. STANDARD PRESSED STEEL CO., Jenkintown 53, Penna.



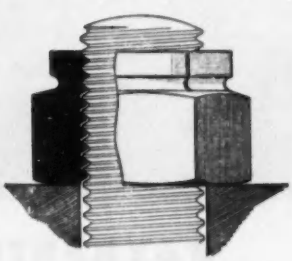
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



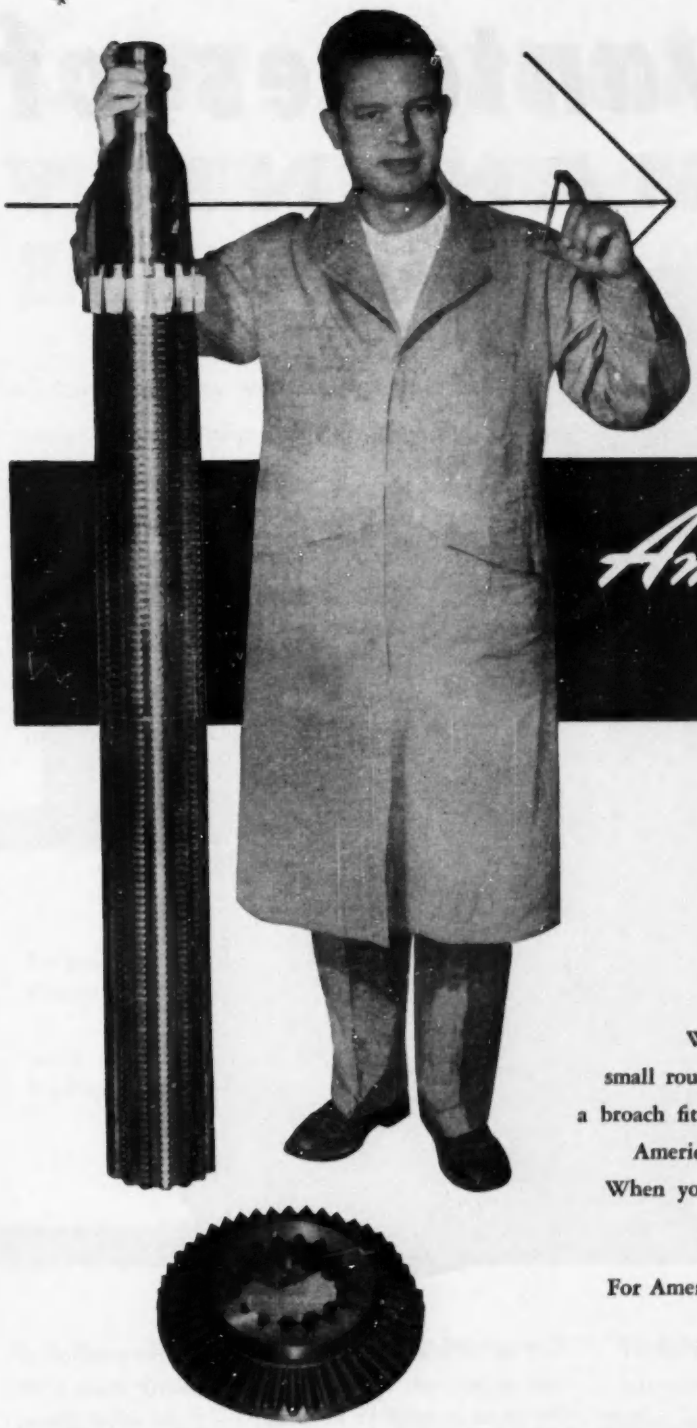
Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

FLEXLOC® LOCKNUT DIVISION

SPS JENKINTOWN PENNSYLVANIA



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American HAS THE ANSWER

American **makes all three—**
Broaches, Fixtures, Machines

Whether it is a large involute spline broach or a small round broach, you stand a better chance of getting a broach fitted to your needs when you specify American. American builds all three — tools, fixtures and machines. When you bring your broaching problem to them they approach it from the over-all view.

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A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

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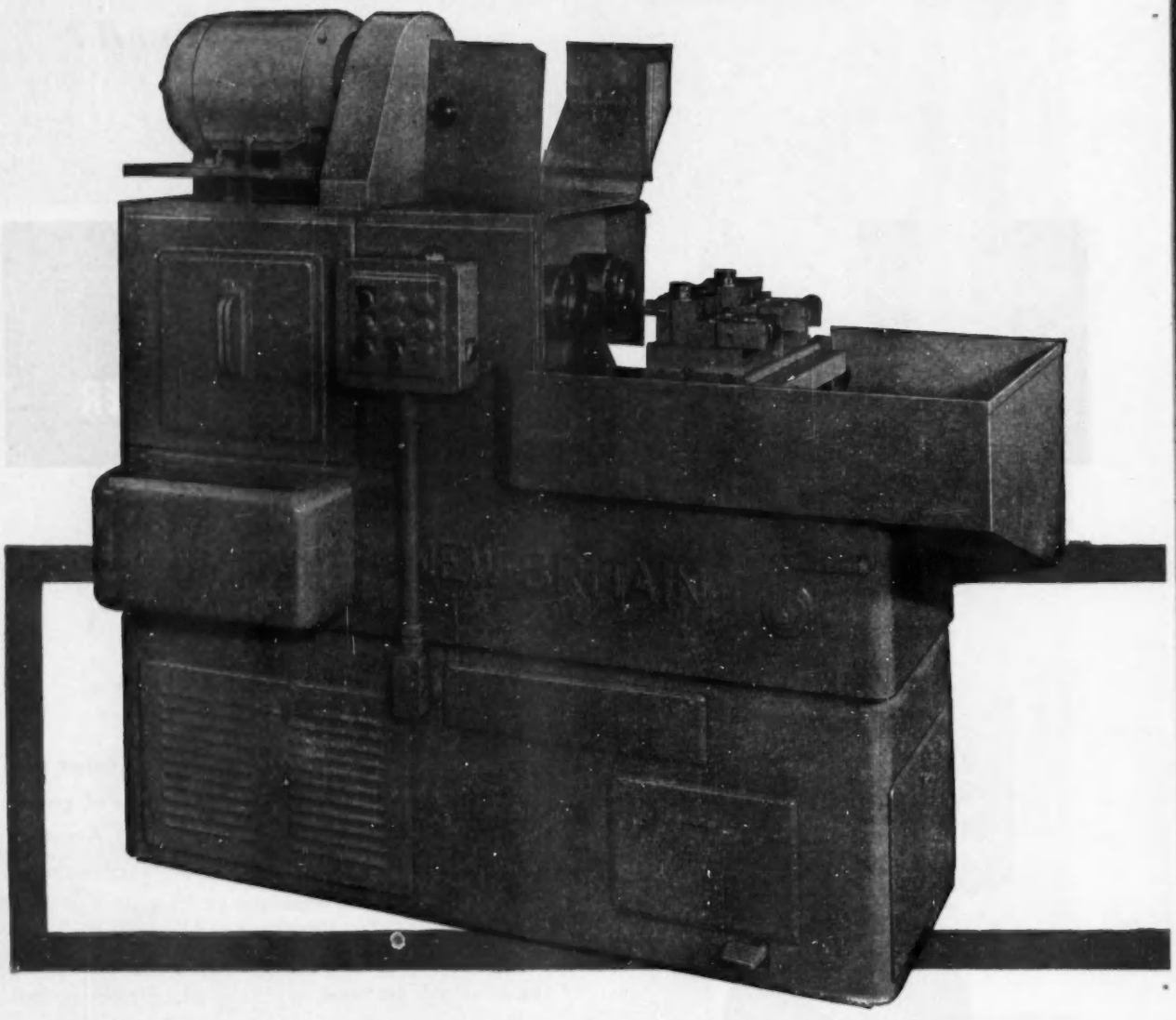
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

The Advantages of PERMANENTLY



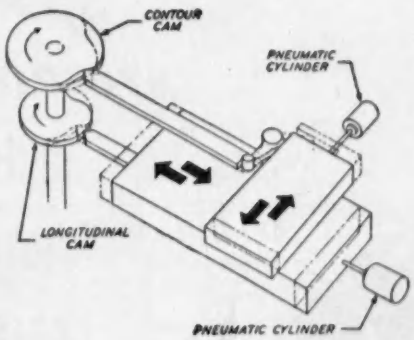
New Britain's exclusive application of cam control (illustrated diagrammatically on the opposite page) gives your tool engineer a completely new approach to tooling for complex pieces. Methods impossible on other types of machines can be employed to speed production and eliminate second operations.

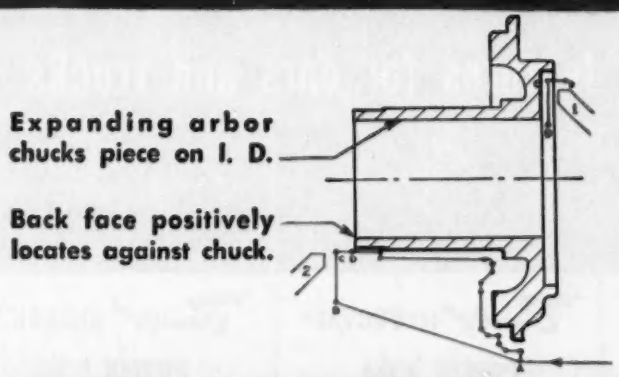
A New Britain precision boring machine will not only turn out a wide variety of work at high speeds, but, because of New Britain's exclusive method of cam actuation, will continue producing them with the same repetitive accuracy — piece after piece, week after week.

Write for descriptive literature on the New Britain boring machine line, including the details of a variety of specific parts turned out on New Britains.

Cam Actuation . . . .
PRESERVED in New
Britain's Precision Boring Machine

- Cam shaft, as well as super precision spindles and their motor drive solidly and permanently mounted to frame for continuing accuracy.
- Rugged precision lever transmits cam motion to cross slide.
- This exclusive method means simple permanently accurate compound slide motion for an endless variety of single point tool paths.





With conventional methods, pieces like this present a problem of costly tooling. With New Britain's new approach, tooling this piece is fast, simple and economical with a single chucking and two single point tools.

When you invest in Boring Machines PICK THE MAKE WITH THE EARNED REPUTATION.

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

Our general catalog is filed in the Sweet's Machine Tool Catalog File.

NEW BRITAIN *Automatics* N.B

Machines for Making Progress

AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

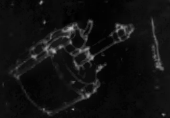
Bendix power

STEERING AND BRAKING

sells more cars

satisfies more customers

Today's most wanted power features for cars and trucks



Bendix * low pedal POWER brake

Specified by more car manufacturers than any other make, Bendix Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from stop-and-go controls. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!

Bendix * POWER steering

Because Bendix Power Steering is of the linkage type, vehicle manufacturers find it especially adaptable for production line installation, without extensive engineering changes. Manufacturers can now meet the increasing demand for power steering more efficiently and more economically with Bendix Power Steering.

Bendix HYDROVAC* POWER brake

With over four million in use, the Bendix Hydrovac is by all odds the world's most widely used power brake for commercial vehicles. This overwhelming preference for Hydrovac is a result of sound engineering design, exceptional performance, low original cost and minimum service upkeep.

Bendix AIR-PAK* POWER brake

With one simple compact unit, Bendix Air-Pak combines all of the well-proven advantages of hydraulic brake actuation with an air brake system. An important advantage of Air-Pak is that brakes can be applied by foot power alone when braking is required before air pressure builds up or if it should fail for any reason.

*REG. U.S. PAT. OFF.

The term "Bendix Power" not only identifies the industry's outstanding power braking and power steering equipment, but describes the unmatched engineering and manufacturing resources behind these products.

It is well that Bendix Products Division be thought of in this dual capacity, for the outstanding acceptance of Bendix power units stems largely from the fact that industry has learned over the years to look to Bendix for the latest and best in power equipment for cars, trucks and buses.

Bendix Products Division

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High Spots of This Issue

★ **Farnborough Air Show Features Small Turbine Engines**

The impressive display last month of British aeronautical progress held much of interest to Farnborough visitors. Of special note was the appearance of small turbine engines, discussed here along with other developments. See Page 48.

★ **Frictional Couplings Responsive to Speed and Torque**

The plethora of power-consuming devices on modern cars has caused a steady widening in the gap between gross and net horsepower. Reviewed in this article is a series of Lipe-Rollway frictional couplings to aid the problem. Page 54.

★ **1954 National Aircraft Show**

Gone forever are the days when air shows consisted of planes racing around pylons. The speedy jets have taken over and set new speed records each year, as at the recent Dayton event with its many equipment displays also. Page 58.

★ **Reverse Thrust Developments for Jet Transports**

Time and again the reversible propeller has proven its value in present air transports. Now the problem is to develop a similar safety aid for jet planes. The author reviews the progress made to date on the problem. Page 64.

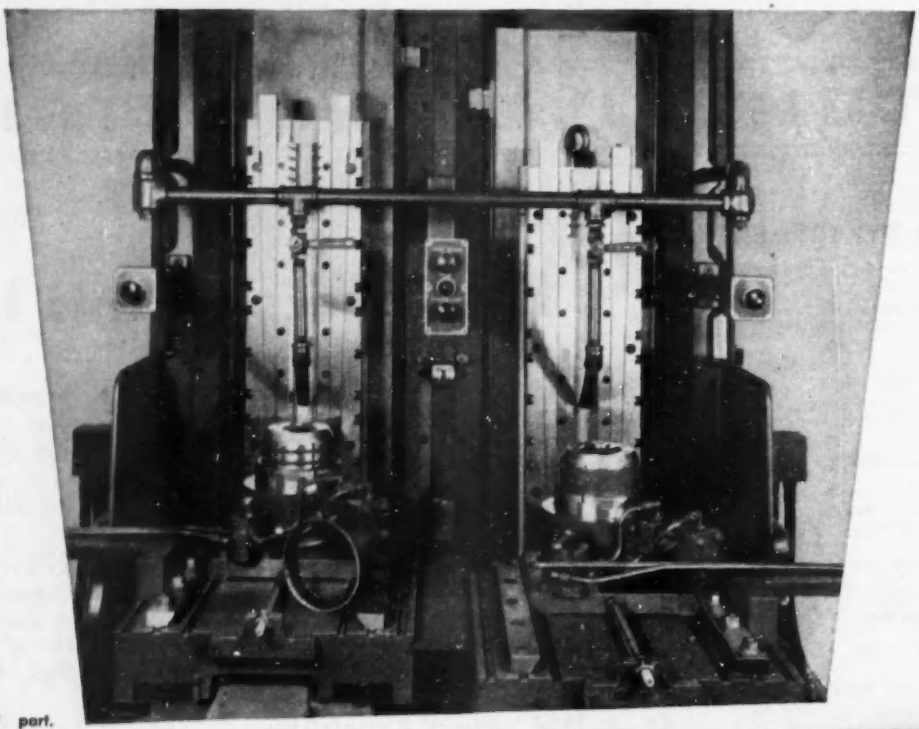
★ **Automation Requirements Discussed at ASME Meeting**

One particularly enlivening element in the program at the recent ASME meeting in Milwaukee was a symposium on the subject of what production engineers expect from machine tools. Various viewpoints are herein presented. Page 100.

★ **30 New Product Items And Other High Spots, Such As:**

New magneto; Instrument Congress; rocket engines on helicopter rotor tips; improved suspension for trailers; aircraft ignition systems; SAE tractor meeting; shipping method for fenders; Italian gear design; rocket engine performance; British crawler tractor; and details of J-65 turbojet.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3



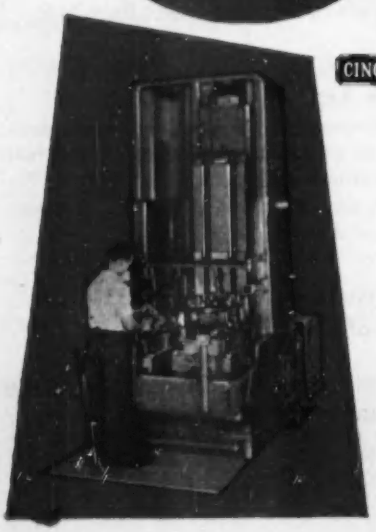
Drawing of part. Solid area indicates material removed.

CINCINNATI Duplex Hydro-Broach tooled up to broach transmission band assembly

Material	Steel
Operation	Broach 41° angular grooves
Stock removal	From solid
Production	283 per hour
Equipment	CINCINNATI Duplex Vertical Hydro-Broach Machine

BROACHING THE EARS On Transmission Bands WITHOUT DISTORTION

You probably have been stymied more than once by machining operations on thin fragile parts. How one part of this type was taken out of the headache class and set up in a smooth, low-cost production schedule is illustrated here. It shows a CINCINNATI Duplex Vertical Hydro-Broach Machine, tooled up to broach the ears on transmission band assemblies. ¶ There are two hydraulically operated, manually controlled fixtures, one for each ram. While the part in one station is being broached, the operator reloads the other fixture. He can take as much time as necessary because the rams do not go through their cycle until the pre-set cycle buttons are pressed (a CINCINNATI safety feature). Other CINCINNATI advantages for low-cost broaching operations include hardened and ground ways... automatic way lubrication, with manual flushing lever... dove-tail clamp arrangement for interchangeability of broach holders and cutting tools as a unit. Principal features and specifications are outlined in Sweet's Machine Tool Catalog. If you would like to have complete data, write for publication No. M-1709-1.



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Catalog No. M-1709-1 contains complete specifications. Write for a copy.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 111, No. 7 **October 1, 1954**

Foundation To Study Sale of Ford Stock

The growing financial competition in the automobile industry is reflected in continuing reports that Ford stock soon will be offered to the public for the first time in the company's 52-year history. While the Ford family will continue to control the vast automobile empire, Henry Ford II has conceded the sale of non-voting shares held by the Ford Foundation, a charitable organization formed by the late Edsel Ford in 1936. The Ford Foundation holds more than 89 per cent of the non-voting shares, the largest public trust on record.

It is expected that trustees of the Foundation will discuss the public offering of the three million shares the organization holds at their first 1955 fiscal year meeting in October. Before any of the stock can be floated, the Foundation must issue its 1953 financial report, which shows how much Ford Motor Co. paid in dividends last year. The company paid a $10 dividend in 1952.

Although the Ford family has owned all of the voting stock in the company since 1919, it is anticipated that the Foundation's stock will be given some voting rights. To reduce its price and spread ownership more widely, the stock may also be split before it is given to banking houses.

Ford stock presently carries a book value of $135 a share. Investment experts, however, feel this is undervalued and that the Foundation could get double that amount.

Present opinion is that sale of the stock would help gain more Ford customers, and that splitting the stock would prevent any one group from accumulating a large block of stock and gaining a voice in management. Such an occurrence could threaten the present control held by the Ford family, it is believed by observers.

FLYING AID TO FARM WORK

Designed specifically for agricultural work, the "utility" airplane is now in volume production at Fletcher Aviation Corp. A contract for 100 planes has been placed by Cable-Price Corp. of New Zealand. The craft has an empty weight of 1909 lb., wing span of 42 ft, overall length of 31 ft, and height of nine ft, four in.

Further Details Disclosed On Proposed Douglas Jet

More new details of Douglas Aircraft's proposed DC-8 jetliner have been revealed by engineering vice-president Arthur E. Raymond. The plane would cruise at approximately 550 mph, have good low-speed and stall characteristics, a 30-deg angle of sweepback, and unusual flap efficiency.

However, he said, slots, spoilers or other complicated devices to secure good control and stability would not be required. Operating range is designed to equal or better that of current piston-powered aircraft.

Most Car Plants Are Back In Swing On 1955 Models

Indicative of the rapid production pace that can be expected in the automobile industry the few remaining months of this year is the announcement by Chrysler Corp. that several of its plants will go on two shifts for the first time in more than a year. Chrysler, the first car maker to shut down for 1955 model changeovers in August, recently resumed operations at all its divisions.

By mid-November, total employment at Chrysler Corp. plants throughout the country should swell to 160,000. This is an increase of nearly 50,000 over the number employed just before the corporation halted production in August.

With the exception of Packard, most car plants will be back in swing on the 1955 models by the end of this month. Due to the transfer of its final assembly operations to its new plant on Connor Ave., in Detroit, Packard is not expected to be in full production on its new models until the middle of November.

The tempo at Studebaker, Pontiac, and Chevrolet is starting to pick up again following shutdowns ranging from two to four weeks. While Ford at presstime had not made any announcement when it would go down to prepare for the new models, a two-week changeover period was expected the beginning of October.

News of the AUTOMOTIVE

LIGHT-WEIGHT FORD EXPERIMENTAL VEHICLE

Seen undergoing trials at the Company's test track is the new Ford XM-151 experimental quarter-ton military vehicle with four-wheel independent suspension using coil springs. Developed by Ford in cooperation with the Army Ordnance Corps, it is said to be 600 lb lighter and 7½ in. shorter than the standard Army quarter-ton vehicle. Powerplant is a new, four-cyl, ohv engine which develops 71 bhp at 3800 rpm. Wheelbase is 85 in.; length, 132 in.; width, 62 in.; height, 67.1 in.; and curb weight, 2140 lb. Ford has been awarded a follow-up contract as engineering consultant during the tests.

Minneapolis Group Buys Federal Motor Truck Co.

Ownership of Federal Motor Truck Co. has changed again. Mast-Foos Mfg. Co., which bought the company in June, has sold the name, tooling, design rights, and inventory to a Minneapolis group which makes and sells truck parts and subassemblies.

The new owners hope to establish the development of specialized vehicles, and will enlarge the service operations. They have a leased option on the company's plant in Detroit, but have made no decision on whether to build there or in Minneapolis.

Linen Upholstery For Cars Is Offered by Packard

Packard Motor Car Co. may set another trend with its new linen upholstery in decorator's colors and designs available in its automobiles as factory-installed, extra-cost, optional trim. Displayed for the first time last month at the Michigan State Fair, along with the first midwest showing of the Packard Panther-Daytona plastic car, the upholstery will be offered later for replacement installation.

The decision to bring out the fabric, a radical change, is one phase of the company's return to the luxury car field. It was based on recommendations of a 500-member panel made up of leading women fashion consultants, editors, and home decorators. Packard set up the panel a year ago to get the female viewpoint on automobile styling and features.

Chief advantages claimed for the new upholstery are that it makes possible almost any print a buyer may want and that the special chemical treatments fortify it for color fastness and long life. It is said to bring a new "feel" to car upholstery. According to Packard, there is no static in the linen, it doesn't crease or wrinkle easily, is spot-resistant, water-repellent, and cleans easily.

Made of Irish flex spun and woven in Belgium, the new linen is available at present on the company's hardtops and a four-door sedan. Four designs and colors are being offered initially.

Nash, Hudson Will Use Same Body Shell in '55

American Motors Corp. has provided a few more answers concerning its future organization and operation. It has officially confirmed that the 1955 Nash and Hudson cars will be built on the same basic body shell, a practice which has been used by the Big Three car makers. Both Nash and Hudson will be produced on the same assembly lines in Kenosha, Wis.

Turning out several different cars from the same basic body shell has enabled manufacturers to save millions of dollars in tooling and fabrication costs. American Motors estimates that it will cut its body tooling costs in half by the practice. For 1955, American Motors plans to produce four different series of Nash and Hudson cars from a single body shell.

AM noted that one large company is producing 14 series of cars with only three basic body shells, another 11 series from three body shells and a third seven series from two basic body shells. Both Nash and Hudson, which are scheduled to be introduced after the first of the year, are expected to be distinctly different in design and appearance and have exclusive engine and mechanical features. The company also confirmed that both lines will have higher horsepower.

While other American Motors plans continue to be guarded closely, the decision to use the same body shell for its cars is considered just the first step in integrating components of the two automobiles. Within a year the company expects to go further in the utilization of interchangeable parts on a broader basis.

Directors Okay Sale Of Baker-Raulang

Directors have approved the sale of Baker-Raulang Co., Cleveland, and its subsidiary, Baker Lull Corp., to Otis Elevator Co., New York. Under the purchase plan, every 3.74 shares of Baker stock will be exchanged for one share of Otis stock. Baker-Raulang, which manufactures material handling equipment, last year had sales of $3.202 million.

AND AVIATION INDUSTRIES

Euclid Presents Tractor With Two-Section Design

Euclid Div. of General Motors Corp. announced its entry into the crawler tractor market last month with a new 380-hp (total) twin-engine, 53,000-lb experimental tractor.

The Model TC-12 Twin Crawler is the first of a projected line of tractors that will meet requirements for earth moving, open pit mining, logging and industrial applications. A total of 20 units will eventually be placed in experimental field service for further tsting.

The two Model 6-71 190-hp GM Diesel six-cyl engines which power the Euclid tractor each drive an Allison torque converter and Allison Torqmatic transmission. Each drive train independently powers one track. Final drive gearing is the same Euclid planetary used in off-highway 50-ton dump trucks and the 25-yard bottom-dump wagon.

Two separate drive and track assemblies are free to oscillate on a seven-in. transverse shaft. The Euclid Twin Crawler can be separated for shipment where weight and width restrictions are encountered. The two-section design is also said to give flexibility over uneven ground.

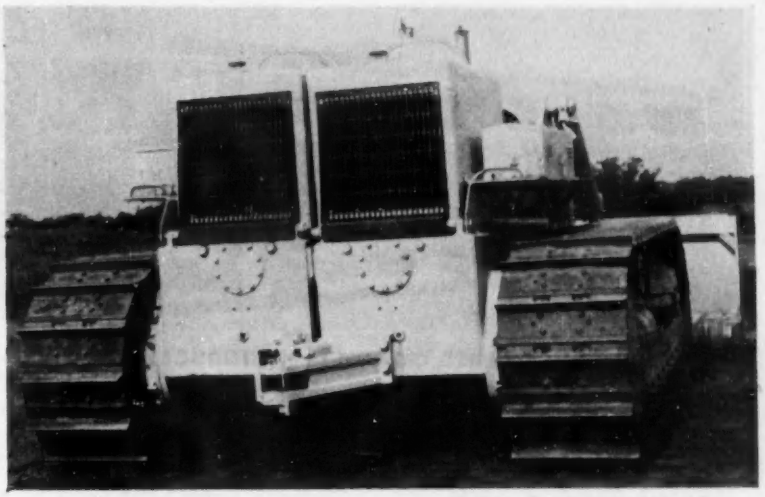
Sales, Production Plans

The new crawler tractor line will be marketed through distributors of the Euclid Div., in addition to present earthmoving equipment products. No new plants are presently planned.

However, effective Oct. 1, GM's Electro-Motive Div. plant in Cleveland, O., was transferred to Euclid Div. for manufacture of the new tractor series. This acquisition will more than double Euclid's present facilities in three other Cleveland plants. Other Euclid products will continue to be manufactured at Euclid, O., plants.

Scraper Trio Bows Too

Along with the announcement of the new crawler tractor, three new experimental rubber-tired scrapers were also introduced. They will be manufactured in limited quantities this year.



Euclid Model TC-12 crawler tractor with twin 190-hp GM Diesel six-cyl engines.

Euclid's entry in the small scraper field is the Model S-7, a seven cu yd, struck-capacity, overhung engine unit. Designed to fit the small self-propelled scraper market, it is powered by a 138-hp Diesel engine. Full 90-deg hydraulic steering enables it to make non-stop turns in 26 ft.

A second new scraper introduced at the preview is the S-18, and 18 cu yd overhung machine. A 300-hp GM engine Series 6-110 is used in conjunction with an Allison Torqmatic Converter and Transmission.

Third scraper is the experimental, overhung-engine Twin Power scraper —the TS-18. It features two 190-hp GM Diesel engines—one in the tractor and the other located behind the scraper bowl driving the rear wheels. These engines drive through Allison Torqmatic converters and transmissions which supply a smooth flow of power to the four drive wheels.

Ionia Mfg. to Make Bodies For Mercury Station Wagon

Bodies for the 1955 Mercury station wagon will be produced by Ionia Mfg. Co., a division of Mitchell-Bentley Corp., under a contract with Lincoln-Mercury Div. The bodies were previously made at the Rouge plant of Ford Motor Co. The Rouge space will be used for other Ford activities.

'For Sale' Sign Goes Up On Another Willys Plant

Kaiser Motors Corp. has put up another one of its plants for sale. In addition to the Maywood, Calif., assembly operations and the Dowagiac, Mich., plant which the company offered for sale, Kaiser plans to dispose of the Willys electronics plant in Toledo.

The electronics facility provides more than 32,000 sq ft of space. It was built almost three years ago and at present is used for the production of aviation electronics equipment for private industry and the Government. Kaiser reportedly is negotiating with a Cleveland investment securities firm for sale of the plant. This is the fourth "surplus" plant that Kaiser has put up for sale since it consolidated with Willys last year, in addition to its huge Willow Run operation which it sold to General Motors.

Gear Grinding Co. Buys Republic Gear

Republic Gear Co., Detroit, has been purchased by Gear Grinding Machine Co., Detroit. The purchase price of $2.7 million includes all assets and two of Republic's subsidiaries, Detroit Bevel Gear Co. and Almetal Universal Joint Co., Cleveland.

News of the AUTOMOTIVE

GMC GILDED COACH IS INTRODUCED

Shown here is a new intercity coach model developed by GMC Truck & Coach especially for turnpike travel. Named the "Golden Chariot" because of its exterior color scheme, it seats 47 passengers and stands 130½ in. high. Forty ft long and 96 in. wide, it is powered by dual GM four-cyl Diesel engines which develop 300 bhp.

Studebaker to Cut Prices On 1955 Passenger Cars

Studebaker has disclosed that its new 1955 passenger car line will carry price tags from $37 to $287 under those on similar 1954 models. C. K. Whittaker, Studebaker executive vice-president, characterized the revised prices as "the first dividend that will accrue to the public as a result of the formation of the Studebaker-Packard Corp."

White Sues International On Tilting Cab Patents

White Motor Co. has filed suit against International Harvester Co. for alleged infringement of five patents relating to forward tilting cabs for motor trucks. The suit was filed in the U. S. District Court for Northern Illinois, Eastern District.

The suit against IHC is similar to one now awaiting trial in the same court against the Diamond T Motor Car Co. This earlier suit was filed in May, 1953.

Kaiser Laying Big Plans For Cars Outside U. S.

Faced with difficult decisions about its future status in the automobile industry, Kaiser Motors has been looking over the fields of South America and other countries to see where it can plant new seeds. Reports that one or more Kaiser plants might be moved to South America have been buttressed by a visit of Henry J. Kaiser to Brazil. The company is known to have big plans for production of cars and trucks in South America and such countries as Peru and Colombia.

Kaiser has already completed an agreement to set up a $25 million plant for production of automobiles and trucks in Cordoba, Argentina. The company sees a 40,000-unit-a-year production potential for that plant. It is not known whether similar plans are in the works for Willys, Kaiser's subsidiary car manufacturer. However, the possibility exists.

GM to Spend $101 Million On Vauxhall Expansion

General Motors Corp. will spend approximately $101.4 million for expansion of its plants in Luton and Dunstable, England, over the next five years. The announcement was made by Harlow H. Curtice, GM president, who is presently touring Europe.

Expected to give a big boost to its export volume of Vauxhall automobiles and Bedford trucks, the expansion program will include a new press shop, body shop and assembly building. Annual production capacity of that plant is about 130,000 vehicles, but this is expected to be doubled when the new facilities are completed.

American Motors Clarifies Its Financial Situation

American Motors Corp. has clarified a recent report in a nationally circulated publication which intimated that it would take the corporation a long time before it was in a position to make much progress because it inherited considerable debt when it merged with Hudson. The magazine contended that American Motors had to borrow $73 million to retire Hudson's debt.

The $73 million, to which the article referred, George W. Mason, president of AMC, explained, is the amount of the new corporation's credit agreement with 28 large banks. He pointed out that AMC merely assumed as a liability only $29.6 million of Hudson borrowing at the time of the Nash-Hudson merger.

Much of the Hudson debt was to finance its defense work, such as inventories of work in progress and accounts receivable from the Government. Nash-Kelvinator, the corporation went on to explain, also owed its banks $40 million at the time of the merger, a great part also for its defense work.

The new corporation continues in a strong financial position. During the past four months, Mr. Mason commented, bank indebtedness of AMC has been reduced by more than $25 million. Inventories have been cut $30 million, and cash and Government securities have been increased $6 million.

Countering a statement in the magazine article that Hudson and Nash cars are competitive, whereas "the Studebaker-Packard combination has the advantage of having non-competitive lines of cars," he declared:

"The size and construction principles of the Nash Ambassador and Statesman and the Hudson Hornet and Wasp models make it possible for us to manufacture them in the same plants starting in December, at a large reduction in burden cost. Likewise, these features will permit great savings in tooling cost and from interchangeability of parts and components. These savings together, which will amount to millions of dollars annually, would be impossible to achieve if the Hudson and Nash lines were entirely dissimilar."

AND AVIATION INDUSTRIES

CORES WITHOUT BOX

This core for a Venturi tube casting was formed at the Foundry Div. of Chambersburg Engineering Co. with cement-bonded sand using a sweep instead of a core box. Elimination of the customary core box is said to have resulted in substantial savings throughout.

Court Ruling Favors Autocar Shareholders

A recent ruling by a Federal judge in Philadelphia authorizing two shareholders of the former Autocar Co. to get cash for their stock may be significant. It could impel other holders of close to 5000 shares of common stock, who voted against the sale of Autocar assets to White Motor Co. last year, to seek cash for their shares. The two who have started the court litigation own a total of 1900 shares of Autocar common stock.

The amount that the two petitioners would receive for their shares was not specified. A committee to appraise the value of the stock would still have to be selected by the court. Both White and Autocar, however, may still appeal the ruling handed down in Philadelphia.

This is the second such case in the industry in recent months. Shareholders of the Hudson Div. of American Motors Corp., who voted against the merger of Hudson and Nash several months ago, have been seeking cash value for their shares. An appraisal committee is yet to be appointed, however.

AI TABLOID

The Air & Hydraulic Div. of Lindberg Engineering Co. is now located in its new Detroit area offices at 1220 S. Woodward Ave., Royal Oak, Mich.

* * *

Ball Brothers, Inc., has purchased a controlling interest in Chardon Rubber Co. . . . American Chain & Cable Co. has bought the Bristol Co.

* * *

Bristol Aeroplane Co., Ltd., has developed a new supercharged turbojet aircraft engine known as the BE 25. Rated at 4000 hp, it is designed specifically for transport operation.

* * *

Bakelite Co. has announced a reduction of 10 cents a pound in the price of its epoxy resins.

* * *

Kaiser Metal Products has changed the name of its Aircraft Div. to Fleetwings Div. . . . Cooper Alloy Foundry Co. has altered its name to Cooper Alloy Corp.

* * *

General Electric Co. is building a gas turbine for the U. S. Maritime Administration that is said to be the largest ever used to drive a merchant ship.

* * *

Inductotherm Corp. is name of new company formed in Glenolden, Pa., for the engineering, manufacture, and sale of induction melting and heating equipment. . . . U. S. Automatic Corp. has organized Bede Products Corp. to specialize in the production of paint heaters.

* * *

Minneapolis-Honeywell has developed a robot hand to operate remotely located controls of reciprocating aircraft or automotive engines during test work.

Douglas Aircraft Co. has started production of its new DC-7C commercial transport. Nicknamed the "Seven Seas," it is powered by Wright turbo-compound engines with a total of 13,000 hp at take-off.

* * *

Aero Design and Engineering Co. has created a Research and Development Engineering Div.

* * *

Included in a major expansion of the Vernon, Calif., plant of Aluminum Co. of America will be two large forging presses of 8000 and 1500 tons, respectively. . . . Verson Allsteel Press Co. has broken ground for a $1.5 million addition to its Chicago plant facilities.

* * *

ACF-Brill Motors Co. stockholders will meet Oct. 6 to vote on a "spin-off" of the assets of the Hall-Scott Div.

* * *

Clark Equipment Co. has adopted fluid couplings as standard equipment on all 3000 to 4600-lb drawbar pull towing tractors.

* * *

Westinghouse Electric Corp. has published a booklet, entitled "They Harnessed the Atom," which describes the role of the company's scientists in the harnessing of the atomic nucleus.

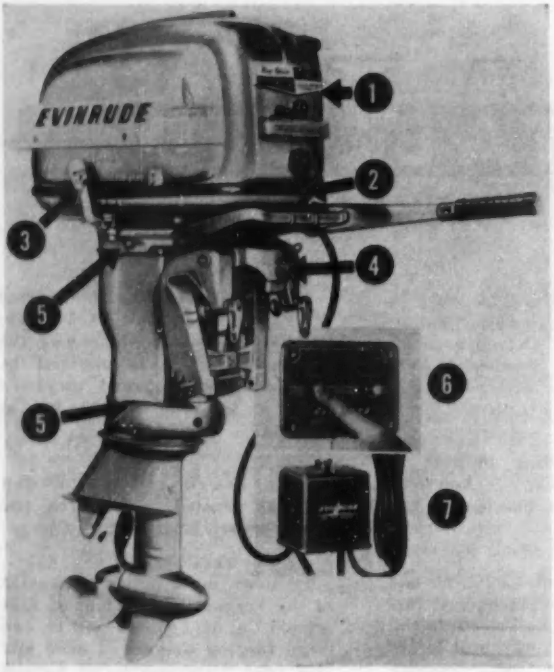
* * *

Continental Aviation & Engineering Corp. is now occupying its newly completed home at 12700 Kercheval Ave., Detroit.

* * *

Boeing Airplane Co. official has predicted that its new gas turbine engine will be competitive with piston-type engines in next five years. He claims drawback of high fuel consumption will be overcome in a reasonably short time.

News of the AUTOMOTIVE



SILENT OUTBOARD

One of four new models in the 1955 Evinrude Motors line, the electric-starting, 25-hp Big Twin delivers speeds from one to 30 mph. It operates on any standard six-volt automotive battery and features: (1) automobile-type lift hood; (2) undercover sound trap which seals off the lower portion of hood; (3) gearshift; (4) anti-tilt trigger to prevent engine from tilting forward on sudden deceleration; (5) aquasonic mountings to pillow vibration; (6) dashboard panel with starter and choke buttons; and (7) transom junction box. Acoustically tuned silencers for the carburetor air intakes are said to be particular aids to quiet operation.

Reinforced Plastics Stand Out At Truck Body, Equipment Show Among Wide Variety of Exhibits

The ever-growing interest in that important segment of the automotive industries was represented in the displays of some 50-odd exhibitors present at the seventh annual meeting and exposition of the Truck Body & Equipment Association in Buffalo, N. Y., last month. With a record registered attendance of 650 persons, the event occupied three days of exhibit visitations and sessions dealing primarily with sales and financial problems of association members.

Among the vast array of products and equipment on display at the show this writer was particularly impressed by the steady trend toward the increased use of reinforced plastics for truck and trailer body components. General Tire & Rubber Co., for example, displayed sections of body trim for the 1955 Ford station wagon, a Diamond T tilt-back cab top, grille for an International Harvester truck, and a White Motor back panel of reinforced fiber glass. In addition, the company had samples of its new Moltopren foamed plastic to be used in Chrysler passenger car crash pads and in Ford side door panels for sound deadening.

Next to the General Tire booth was a Libbey-Owens-Ford exhibit of fiber glass insulation for trucks, while across the aisle was the booth of Clearfield Plastics Co. The latter, a relative newcomer to the field, is actively engaged in the production of one-piece molded fiber glass truck roofs up to 32 ft in length, reinforced fiber glass doors and framing, and other plastic components. In addition, the company is turning out plastic hardtops for MG and Jaguar cars.

Hicks Body Co., well-known school bus body builder, has changed its name to Hicks Body and Chemical Products Co., Inc., with the formation of a new Fibreform Div. Main function of the new division will be the production and sale of reinforced plastics components for all types of commercial bodies. Samples of the development work which the company has already done in this field were on display.

Included in the ranks of other exhibitors at the show and examples of the products shown were: Aluminum Co. of America (scale model of aluminum truck body and samples of new 54 S aluminum alloy); Chelsea Products, Inc. (power take-off units); Dow Chemical Co. (samples of monocoque construction for magnesium van bodies); Du Pont Co. (truck finishes); Jones & Laughlin Steel Corp. (high-strength steels); and Parish Pressed Steel Co. (truck body sections).

FORD ONLY TRUCK MAKER TO SHOW PERCENTAGE GAIN

1954 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1954 Seven Months Totals

MAKE	July 1954	June 1954	July 1953	SEVEN MONTHS Units 1954	Units 1953	Per Cent of Total 1954	Per Cent of Total 1953
Chevrolet	24,171	31,284	27,782	178,362	201,374	35.38	36.49
Ford	19,478	31,349	20,041	104,264	135,822	32.93	24.59
International	6,883	7,178	7,966	48,719	60,853	9.77	11.03
G.M.C.	5,278	5,854	7,315	41,969	52,373	8.24	9.49
Dodge	4,764	5,883	6,467	36,847	53,131	7.19	9.63
Studebaker	889	1,013	1,827	6,539	10,429	1.31	2.89
White	799	968	1,272	6,389	7,651	1.28	1.39
Willys Jeep	669	611	709	4,304	5,444	.86	.99
Willys Truck	783	848	618	4,128	5,610	.83	1.02
Mack	573	609	699	3,615	4,069	.72	.74
Diamond T	210	224	303	1,615	2,004	.32	.36
Reo	156	225	2332	1,391	2,210	.28	.40
Brockway	108	107	1185	1717	1,230	.14	.22
Autocar	65	104	123	709	1,044	.14	.19
Misc. Domestic	342	409	885	2,904	3,448	.58	.63
Foreign	45	48	16	172	160	.03	.03
Total—All Makes	65,181	85,859	78,161	488,884	551,845	100.00	100.00

* Based on data from R. L. Polk & Co.

AND AVIATION INDUSTRIES

Suit Aimed at Franchise System in Car Industry

The lawsuit by two used car dealers in Waterbury, Conn., against several new car dealers, the Big Three car manufacturers and the National Automobile Dealers Association is an indication of many other such litigations cropping up in the automobile industry. It is the second such action by used car dealers against new car dealers in recent weeks.

The two Waterbury dealers charge the "defendant manufacturers" with monopolizing the manufacture, distribution, and sales of automobiles. Because they were unable to get a franchise or cars from the manufacturers, the two Connecticut dealers reportedly went into the business of selling cars through "bootleg" channels.

The two, Erwin Hathaway and James Walsh, who are in the process of liquidation, are asking for triple damages totaling $1.232 million. Their suit names nine local franchised dealers, in addition to Ford, General Motors, Chrysler and NADA.

Another similar action recently was taken by two Wichita, Kans., used car dealers against 12 new car dealers in that city. That suit, however, does not involve the car manufacturers nor NADA.

Kearney & Trecker Subsidiary To Assemble Business Planes

Royal Aircraft Corp. is the name of a new subsidiary formed by Kearney & Trecker Corp. to assemble aircraft for sale to business firms. According to present plans, airframes and wings of the twin-engine, five-passenger plane will be made in Italy by Piaggio & Co. The 260-hp Lycoming engines, plus other components, reportedly will be purchased here.

Ford Car Production Hits Postwar High

Ford Motor Co. during the first eight months of this year produced 1,413,816 vehicles, compared with 1,184,214 last year. Production of Ford cars alone in that period hit a postwar high of 985,972 against the previous postwar 1950 high of 834,303.

CHEVROLET BACK IN FIRST PLACE BY HAIR'S BREADTH

1954 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1954 Seven Months Totals

MAKE	July 1954	June 1954	July 1953	SEVEN MONTHS Units 1954	Units 1953	Per Cent of Tota 1954	Per Cent of Tota 1953
Chevrolet	119,544	152,028	126,040	817,396	798,122	24.84	23.39
Ford	109,893	169,804	99,178	816,470	574,678	24.81	16.84
Buick	47,051	52,783	43,194	306,640	279,938	9.32	8.20
Plymouth	37,791	42,776	54,864	254,219	357,233	7.72	10.47
Oldsmobile	40,426	44,234	32,923	235,551	201,264	7.16	5.90
Pontiac	27,221	33,883	39,352	209,609	242,733	6.34	7.11
Mercury	24,910	27,972	22,270	177,386	141,738	5.39	4.15
Dodge	12,447	14,114	26,656	90,827	187,239	2.76	5.48
Cadillac	10,233	11,650	9,752	63,960	66,213	1.94	1.94
Chrysler	7,736	8,726	14,321	63,231	95,876	1.92	2.81
Studebaker	8,463	8,170	13,480	56,431	97,801	1.71	2.86
Nash	7,589	8,605	12,178	51,341	98,716	1.56	2.89
De Soto	5,956	6,701	11,185	46,596	73,780	1.42	2.16
Packard	2,661	3,166	6,470	25,386	51,008	.77	1.49
Lincoln	3,031	3,612	4,435	22,836	25,998	.69	.76
Hudson	4,276	3,713	6,236	21,362	44,782	.65	1.31
Willys	1,679	1,914	3,140	11,379	30,495	.35	.89
Kaiser	759	891	2,067	5,553	17,606	.17	.51
Henry J	71	97	1,173	782	8,242	.02	.24
Miscellaneous Domestic	241	229	210	1,416	1,812	.04	.05
Foreign	2,294	2,374	2,489	13,774	18,932	.42	.55
Total—All Makes	474,316	598,753	533,783	3,291,116	3,413,609	100.00	100.00

* Based on data from R. L. Polk & Co.

Work Commences at Pa. Location for First Atomic Energy Plant

Ground was broken last month at Shippingport, Pa., for the nation's first full-scale atomic power plant that is expected to provide electricity for serving the needs of nearly 500,000 consumers. The plant, a joint effort of Duquesne Light Co., Westinghouse Electric Corp., and the Atomic Energy Commission is tentatively scheduled for initial operation in 1957.

The reactor for the power station is being designed and constructed by Westinghouse. It will be located underground encased in a shell of steel and concrete and will have a core made up of uranium elements.

1954 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

Price Group	July 1954 Units†	July 1954 % of Total	July 1953 Units†	July 1953 % of Total	Seven Months 1954 Units†	Seven Months 1954 % of Total	Seven Months 1953 Units†	Seven Months 1953 % of Total
Under $2,000	279,479	59.23	294,834	55.51	1,956,798	59.78	1,831,286	53.96
$2,001 to $2,500	123,281	26.13	181,920	28.65	833,402	25.43	965,207	28.44
$2,501 to $3,500	51,290	10.87	63,180	11.90	352,427	10.76	454,965	13.40
Over $3,500	17,786	3.77	21,193	3.99	132,129	4.03	142,621	4.20
Total	471,836	100.00	531,127	100.00	3,275,756	100.00	3,394,949	100.00

Dollar Volume of Sales*

Price Group	July 1954 Dollars	July 1954 % of Total	July 1953 Dollars	July 1953 % of Total	Seven Months 1954 Dollars	Seven Months 1954 % of Total	Seven Months 1953 Dollars	Seven Months 1953 % of Total
Under $2,000	$ 509,289,100	50.87	$ 524,910,127	47.96	$3,867,634,902	51.35	$3,274,838,184	45.40
$2,001 to $2,500	282,897,095	28.25	336,464,185	30.35	1,906,838,226	27.45	2,154,005,164	29.86
$2,501 to $3,500	136,807,102	13.96	173,219,825	15.53	962,804,829	13.86	1,248,296,074	17.31
Over $3,500	69,275,573	6.92	78,716,238	7.06	510,108,899	7.34	535,146,318	7.43
Total	$1,001,239,870	100.00	$1,115,310,375	100.00	$6,947,186,856	100.00	$7,213,332,790	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co. in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include import A foreign cars.

Men in the News

Cincinnati Milling Products Div., Cincinnati Milling & Grinding Machines, Inc. — Philip O. Geier, Jr., has been appointed sales manager.

Chambersburg Engineering Co.—**Brig. Gen. R. W. Daniels** (USA, ret.) has been appointed adviser on special plans.

Morse Chain Co.—**Clayton L. Jones** has become master mechanic.

New Departure Div., General Motors Corp.—**Robert H. Wilkie** was made eastern regional sales manager, succeeding **James P. Gillilan,** who assumes the position of assistant to the sales manager. **Robert E. Randel** succeeds him in charge of advertising and sales promotion.

American Brakeblok Div., American Brake Shoe Co.—**Robert B. Pogue, Jr.,** is now assistant manager of equipment sales.

Garlock Packing Co.—**J. B. Sewell,** has been appointed general sales manager.

Westinghouse Electric International Co.—**Charles H. Shuff** has been named director of the Defense Relations Dept. and **C. V. Aggers** has been chosen assistant director.

Kellett Aircraft Co.—**W. Paul Jones,** chairman, has also become president.

Norton Co.—**John Cook,** Grinding Dept. foreman, has retired, and **Stewart O. Bailey** succeeds him. **Charles M. Wellons** is now an abrasive engineer in the Philadelphia territory; **Robert C. Divoll,** an abrasive engineer for part of the Pittsburgh territory; **Charles R. Garfield,** a field engineer at the Pittsburgh district office; **William J. Mahan,** field engineer for abrasive grain applications in New England (except Connecticut) and upper New York State; and **Joseph F. Hartl,** sales engineer, abrasive grain, for Connecticut.

Carboloy Dept., General Electric Co.—**Robert A. Canning** has been named manager of quality control.

Chrysler Corp.—Gordon S. Turnage has been named manager of estimating and routing, and Aloysius C. Breitenbeck has been appointed manager of process and methods, defense operatios.

Signal-Stat Corp.—**John B. Dickson** has been appointed chief engineer in charge of lamp and lens optical design and development.

Ford Motor Co.—**Archie McCardell** is now plant controller, and **Joseph A. Avenatti** has become general superintendent of production at the Buffalo assembly plant.

Chevrolet Motor Div., General Motors Corp. — Bernard J. Langford has been appointed assistant traffic director.

Gemmer Mfg. Co.—**Peter Lilicy** has been appointed treasurer and assistant secretary.

Ford Motor Co., Parts & Equipment Mfg. Div.—**Charles I. Lee** has been promoted to industrial relations manager at the Monroe, Mich., plant.

General Motors Corp.—**L. J. Lucia** has been appointed general auditor.

American Motors Corp. — Jack J. Timpy has been elected vice-president, while Donald P. Else is now comptroller.

Electric Auto-Lite Co.—Frank J. Kennedy has been made administrative assistant to the president.

Eutectic Welding Alloys Corp.—**J. P. Coughlin** has joined the company as assistant to the president.

General Petroleum Corp.—**Calvin T. Thomas** has been named manager of the Transportation Dept.

St. Paul Hydraulic Hoist—**Ross Miller** has been made sales manager.

MoPar Motor Parts Div., Chrysler Corp.—**Jack Sweedyk** was appointed advertising manager; **T. P. Wheelwright,** sales promotion manager; **Roy W. McAda,** sales supervisor of western regions; **George W. Warner,** sales supervisor of eastern regions; **De Vere H. Woodruff,** sales supervisor of wholesaling and distribution; and **S. J. Henning,** sales supervisor of merchandising and sales programs.

United Motors Service Div., General Motors Corp.—**Cleve Webb** has been chosen Pacific regional manager.

United Aircraft Products, Inc.—**Frank A. Ryan** has been named general manager of the Contractual Engineering Dept.

Gear Grinding Machine Co.—**William F. Wilson** is now vice-president in charge of engineering and manufacturing.

Delco-Remy Div., General Motors Corp.—**Herman J. Staggenburg** has been appointed manager of Delco battery operations.

Tung-Sol Electric, Inc.—**John D. van der Veer** was appointed assistant general sales manager.

National Automotive Fibres, Inc.—**J. R. Millar** was elected acting president, and **William J. Athanson** was elected a director.

George L. Nankervis Co.—**Arthur F. Liska** has been appointed controller.

Phillips Corp.—**K. Bert Bowman** is now production manager.

De Soto Div., Chrysler Corp.—Erwin H. Graham has been appointed comptroller.

Le Roi Co.—Herschel V. Hiatt was named general manager of the Engine Div., and Ray H. Rodolf was chosen general manager of the Compressor Div.

Solar Aircraft Co.—John M. Dolan has been appointed vice-president for sales.

Minneapolis-Honeywell Regulator Co., Industrial Div.—**Charles W. Bowden, Jr.,** was named market extension manager.

Chevrolet Motor Div., General Motors Corp.—**Grosvenor Swift** has been appointed manager of the Toledo, O., plant.

Solventol Chemical Products, Inc., Industrial Chemical Sales Div.—**Dr. Henry A. Goldsmith** is now chief chemist, and **Ben Ray** was made manager of technical field service.

American Brake Shoe Co., Kellogg Div.—**J. Robert Pauline** has been appointed vice-president.

DeWalt, Inc.—**Conde Hamlin** has been elected vice-president in charge of sales and a director.

Rochester Products Div., General Motors Corp.—**Robert K. Hathaway** has been appointed carburetor service engineer.

Solar Aircraft Co.—**Clifford W. Snyder** has become comptroller, while **Leon R. Noel** is now vice-president for finance.

General Metals Corp.—**Harold J. Mock** has been appointed executive vice-president and general manager of Adel Precision Products Div.

Ramo-Wooldridge Corp., Guided Missile Research Div.—**Louis G. Dunn** was made associate director.

Fairchild Engine & Airplane Corp., Engine Div.—**Raymond I. Schneyer** has been named project engineer for the new gas turbine laboratory.

General Electric Co., Carboloy Dept.—**E. C. Graves** has been chosen superintendent of product manufacturing.

General Electric Co.—**Robert M. Coultas** has been chosen manager of transportation industries sales.

Steel Improvement & Forge Co., Champion Div.—**Walter O. Lewin** has been made general manager.

Westinghouse Electric Corp.—**Thomas R. Lawson** was appointed sales manager of the Sunnyvale, Calif., manufacturing plant.

Northrop Aircraft, Inc.—**Fred J. Baum** has been elected an assistant secretary.

Clark Equipment Co.—**Paul Schultz** has been named to a general staff position with responsibility for carrying on standardization work in engineering and control procedures.

Lockheed Aircraft Corp., Georgia Div.—**Russell C. Galbraith** was chosen director of financial operations.

L. A. Young Spring & Wire Corp.—Russell B. Robins has been named director of marketing and merchandising.

Ford Motor Co., Special Product Div.—**Earl A. Brown, Jr.,** was named parts and service manager, and **Allan F. Wilson** was made advertising and sales promotion manager, in the Sales Dept.

General Motors Corp.—**Ronald K. Evans,** executive vice-president and director, has retired.

Autocar Div., White Motor Co.—**Karl Pearson** has been named eastern regional sales manager.

Bendix Products Div., Bendix Aviation Corp.—J. Allan MacLean has been made manager of the automotive products section, and C. Wayne Brownell succeeds him as director of industrial relations.

Kaiser Steel Corp.—**Robert W. Bowles** was named manager of specialty steel sales.

Morse Chain Co.—**Stephen J. Morris** was made general purchasing agent.

Necrology

A. K. Mills III, 52, director of the Ford Motor Co. archives, died Sept. 12, at Grosse Pointe, Mich.

Henry E. Hund, 65, chairman of the board of Reo Motors, Inc., died Sept. 10, at Detroit, Mich.

Burt J. Craig, 69, former vice-president and treasurer of Ford Motor Co., died Sept. 2, at Detroit, Mich.

Robert J. Minshall, 56, former vice-president of Boeing Aircraft Co., died Sept. 7, at Shaker Heights, Ohio.

James S. Booth, 66, automobile designer and producer of the old Scripps-Booth car, died Sept. 13, at Nowalk, Conn.

Henry P. Folland, 65, former managing director of Folland Aircraft Co., died Sept. 5, at Nottingham, England.

Chauncey McCormick, 69, a director of International Harvester Co., died Sept. 8, at Bar Harbor, Me.

George D. Gilbert, 58, former general manager of Baldwin-Duckworth Div., Chain Belt Co., died Sept. 5, at Hartford, Conn.

Hyman Goldburg, 52, director of sales and service for Parker-Kalon Div., General American Transportation Corp., died Sept. 1, at New York, N. Y.

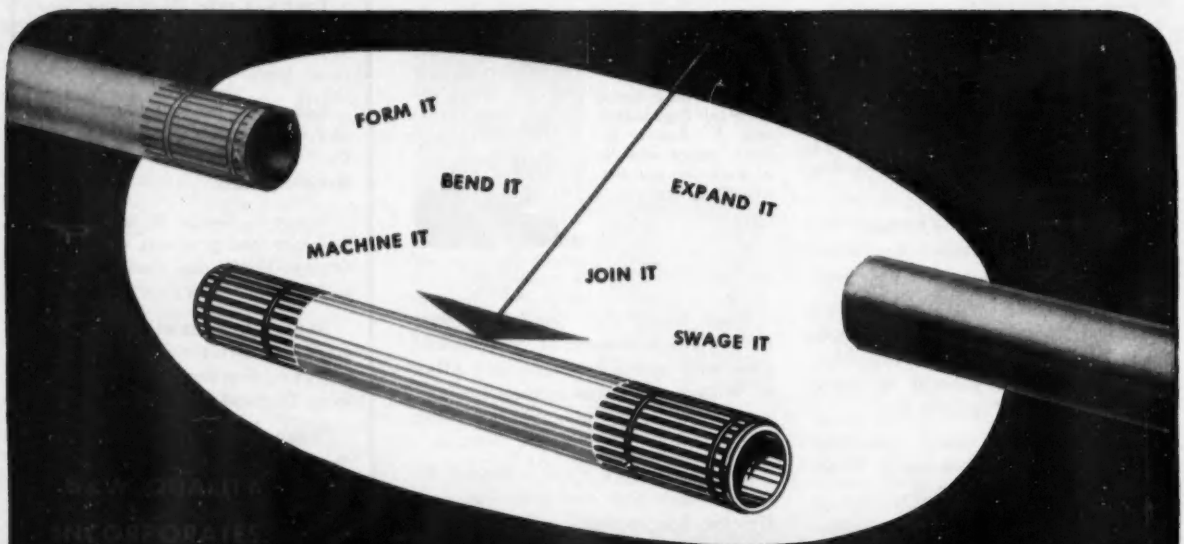
Clay Smith, 39, well-known Indianapolis Race mechanic, was killed in an accident Sept. 6, at Duquesne, Ill.

F. Lloyd Woodside, 58, president of Park Chemical Co., died Aug. 9, at Detroit, Mich.

QUALITY
in
B & W
CARBON STEEL

A — AVAILABILITY
S — SERVICE
Q — QUALITY

SEAMLESS
MECHANICAL TUBING
Makes Your Fabricating Easy



Mechanical properties to best fit your end-use requirements.

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Desired tolerances and concentricity.

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THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-4051 (CSM)

"The Lowest Bidder

It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all.

When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

John Ruskin

1819-1900

Especially true of Gears

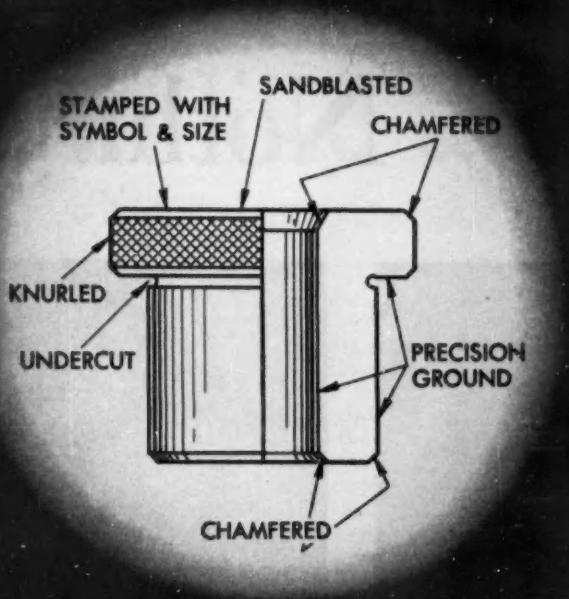
DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA



THE INSIDE STORY OF EX-CELL-O DRILL JIG BUSHINGS

Here are a few good reasons why Ex-Cell-O Drill Jig Bushings last longer and perform better:

1. High carbon chrome bearing steel is selected for maximum wear and deep-hardened to 62-64 Rockwell "C" in automatic equipment.
2. Every bushing must measure up to Ex-Cell-O precision standards, as well as to A.S.A. standards.
3. High finish is ground on inside and outside diameters, and *under the head* for perfect bearing.

The country's largest users of bushings are Ex-Cell-O customers. Order from the Ex-Cell-O Catalog.

To satisfy the needs of your purchasing and engineering departments be sure to have an adequate supply of Ex-Cell-O Bushing Catalogs. Ask for the number of copies you need.

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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

On any carbide grinding job...

Nothing

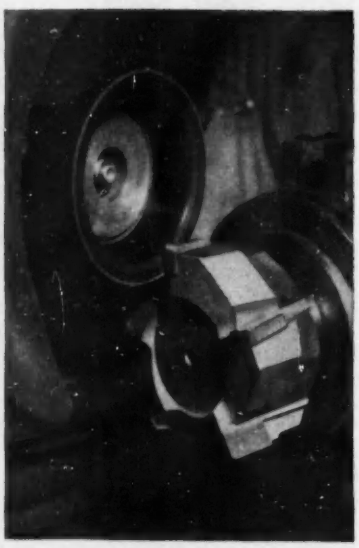
Norton Vitrified Bonded Diamond Wheels

outperform all others of this type. They combine the fast cutting action of resinoid bonded wheels with resistance to grooving approaching that of metal bonded wheels. Great durability is another advantage, since the vitrified bond adheres to the diamond particles and holds each one tightly for maximum useful life.

Production Grinding of Single Point Carbide Tools is most economical and efficient with Norton vitrified bonded diamond wheels. Grinding chip breakers, as illustrated, is another important job for which they are ideal. One outstanding advantage is that they hold their corners exceptionally well.

Norton Resinoid Bonded Diamond Wheels

provide the fast cutting and long, money-saving wheel life that make them favorites for precision sharpening jobs. Made in two bond types — regular, for wet grinding and B6, for dry grinding. It is always more economical to use each bond type on the applications for which it is best suited, rather than to try to make one type serve for both wet and dry grinding.



On Your Multi-Tooth Grinding Jobs, Norton resinoid bonded wheels hold size so that each tooth gets the uniform grinding vital to good cutter performance. And in the straight, thin shapes permitted by the resinoid bond they make excellent cut-off wheels for salvaging damaged carbide tools.

Norton wheel cuts like a diamond

Diamond wheels in carbide grinding more than pay for themselves. "It's just like finding money."

You can cut grinding time — and grinding costs — to the lowest possible by standardizing on Norton diamond wheels.

As a result of Norton Company's long pioneering† in diamond wheel development, Norton diamond wheels bring you a combination of long service life and efficient cutting action that means maximum economy — across the entire range of carbide grinding applications.

Besides the vitrified and resinoid bonded types shown here, Norton diamond wheels are also available in a metal bond — where durability and resistance to grooving, rather than a fast rate of cut, are primary considerations. For every application the proper size and type of Norton diamond wheels are available in a wide variety of grit sizes. (*For small-volume requirements, Norton K Bond* CRYSTOLON* *wheels are often the best investment. See illustrations.*)

See Your Norton Distributor

for aid in selecting the right Norton wheels for every grinding job. And ask him for the 142-page, illustrated booklet: "Grinding Carbide Tools." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products . . . to make other products better

Norton K Bond CRYSTOLON* Wheels

feature fast, cool cutting and exceptionally uniform performance. The vitrified K Bond permits half-grade increments of hardness, enabling you to "pin-point" your specifications. Use these wheels for roughing and backing off. Usually preferred in green CRYSTOLON, but also available in gray.

For Small-Volume Carbide Grinding, especially in single-point applications, the K Bond wheels offer outstanding economy. Their high stock removal rate and uniform performance assure quality grinding at lowest cost.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

†First with resinoid bonded, first with metal bonded, first with vitrified bonded diamond wheels.

W-1578

NORTON

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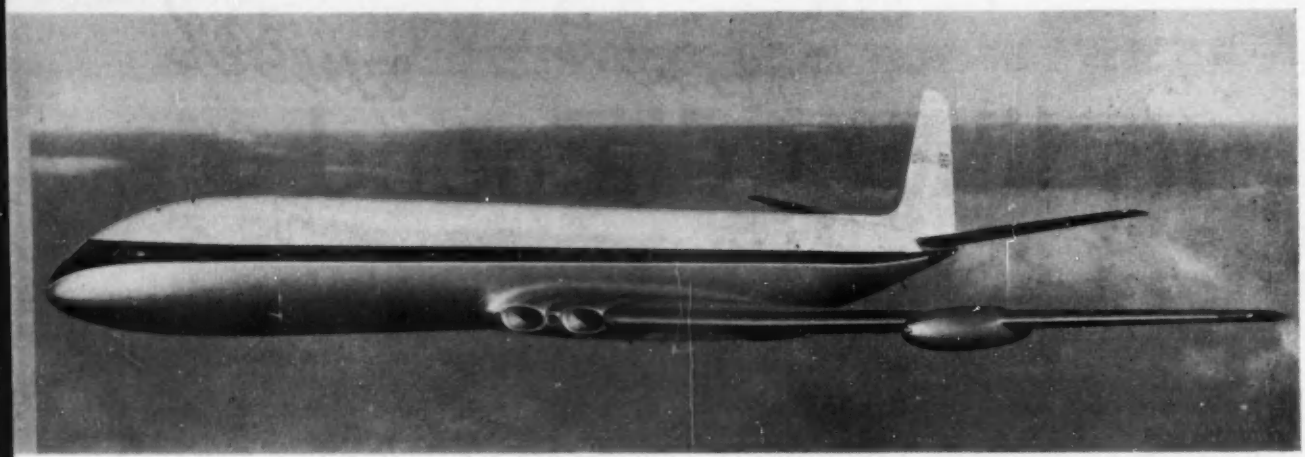
NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



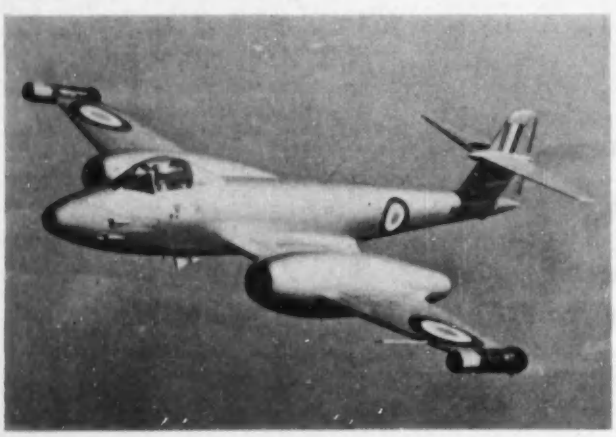
De Havilland Comet 3, powered by four Rolls-Royce Avon turbojets

Small Turbine Engines Featured at Farnborough Air Show

FARNBOROUGH, ENGLAND

BRITAIN'S annual aeronautical display at Farnborough, from September 6 to 12, revealed the necessity of stepping up production and of shortening the time between the design stage and military or civilian use. The British aeronautical industry is trying to digest the wealth of new material presented in 1952 and 1953, with the result that this year there are comparatively few models which have not already been seen in some form or other. However, the show was organized on an elaborate scale, and the flying display carried out with military precision before probably the largest number of foreign visitors ever gathered around this flying ground.

A movement of some significance was the appearance of small turbine engines. Rolls Royce presented the pure jet axial flow Soar, which has a thrust of 1810 lb for a weight of 267 lb, a diameter of 15¾ in., and length 62¾ in. Two of these engines were wing tip mounted on a Gloster Meteor, and the plane flown with its main Derwent engines shut off. Particulars regarding this engine were not released, but it was learned that its fuel consumption was 20 per cent higher than that of other turbines of equal power, that it could be started and stopped in flight, but that its speed could not be varied, that its compressed air starter could be used only once and that its useful life was 20 hours.



Gloster Meteor with Rolls-Royce Soar engines on the wing tips

Still less was revealed regarding the Bristol Orpheus, a lightweight, medium thrust turbojet now under development, expected to be out next year and which will power the new Follard Gnat fighter. It is stated that the Orpheus will give three times the 1640 lb thrust of the Viper. Meanwhile the Gnat prototype is flying on the Armstrong Siddeley V5 Viper, an engine which has a dry weight of 460 lb, a diameter 23.2 in., and a length 65.4 in. The Viper is made in two versions, the one expendable for the Australian Jindivik target, and the other designed for long service. Manufacturing rights for this engine have been acquired by the French Dassault Co.

DH.110 transonic day and night jet fighter which combines very high performance with modern electronic navigation and combat aids

Blackburn & General Aircraft Co. showed the 500 and 600 series of jet engines built from the French design Turbomeca. Two of these, the Palas model, were fitted in the Sherpa research aircraft produced by Short Brothers & Harland. The Palas is suitable for installation in small aircraft such as trainers and targets. It has a take-off thrust of 390 lb, dry weight of 148 lb, with a length of 25.32 in., and a maximum diameter of 17.1 in.

D. Napier & Son uncovered the Oryx turbo-gas-generator for helicopter service and which will first be used in the Fairey Rotodene. Revealed information regarding this is limited. With a dry weight of 495 lb, its gas horsepower at take-off is 750, its length 83½ in., and width 19¼ in.

The Oryx is designed for helicopter service where the rotor is propelled by jet reaction at the rotor blade tips. The engine consists of main and auxiliary axial flow compressors driven by a turbine coupled to the compressor shafts. The main compressor delivers air to five combustion chambers, in which fuel is atomized and burned continuously, and the turbine, driven by the combustion products, drives the main and auxiliary compressors. Compressed air from the auxiliary compressor, together with exhaust gases from the turbine, are mixed together in a collector and directed through a two-way valve to the rotor head. Control of the engine is effected by a single lever operating a fuel metering unit which automatically compensates for variations in flight conditions.

Gas turbines as auxiliaries on planes are receiving attention. Rover exhibited its IS/60 model of 60 bhp with a bare weight of 116 lb. As a bare engine its dimensions are 23¾ in. high, 18½ in. wide and 19 in. in length.

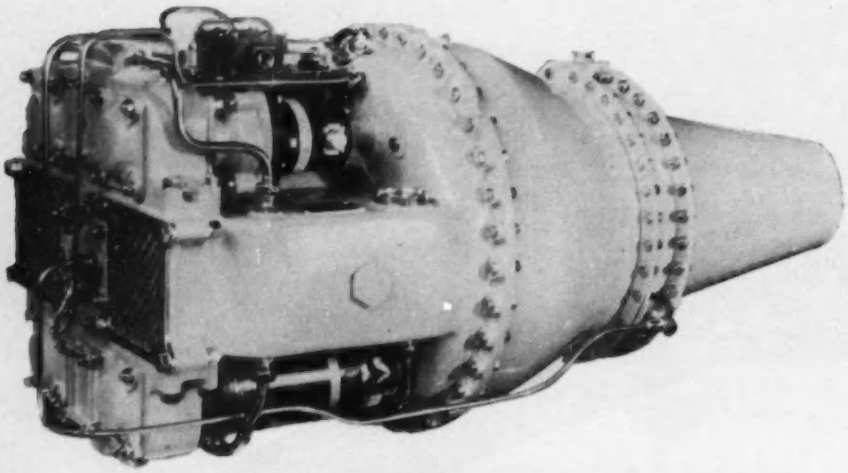
Although no entirely new engines were displayed, several developments of existing models were in operation on the flying test beds. Armstrong Siddeley produced the Sapphire Series 7; two of these powered a Canberra which gave flight demonstrations. The model immediately preceding this, the Canberra 6, is rated at 8000 lb thrust. How much more is obtained from the Series 7 is a matter of secrecy. De Havilland is working on the Gyron, but only information regarding it is that it will have greater thrust than any engine at present in existence.

A private venture by the Bristol Aeroplane Co. is

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

the BE 25 supercharged turboprop, with an output of 4000 hp. This power is said to remain constant from sea level to a considerable altitude. It is claimed that the BE 25 combines the best features of the Proteus and the Olympus which made possible the world altitude record.

In the BE 25 the high pressure compressor, the combustion chambers and high pressure turbine provide a stream of high velocity, high temperature gas which



Palas Turbomeca, built by Blackburn and General Aircraft, Ltd., and used on Sherpa research aircraft

New Rolls-Royce "River-Class" axial-flow jet engine, the Soar

drives the low pressure turbine. This turbine is connected by a shaft to the low pressure compressor which supercharges the high-pressure compressor and also drives the reduction gear and propeller. There is no mechanical coupling between the high pressure compressor/turbine system and the low-pressure compressor/turbine system.

Using the Canberra as a flying test bed, the Bristol Olympus jet engine demonstrated its ability for quick acceleration. From throttled down to full open, the time interval was only two and a half seconds. Two years ago the Olympus was officially rated at 9750 lb thrust. Undoubtedly there has been considerable increase since then, but no figures are revealed. The Olympus jet has two compressors in series, each driven by a separate turbine, with no mechanical coupling between the turbines. The first compressor (low pressure) feeds the second (high pressure) so that each can run at its optimum speed. The latest type Olympus is scheduled for super priority for the Avro Vulcan fighter.

Two entirely new machines were the Sherpa built by Short Brothers & Harland, Ltd., and the Midge, produced by Folland Aircraft, Ltd. The Sherpa features the aero-isoclinic wing, which is not made as stiff as possible but is relatively flexible to allow it to distort in an advantageous manner. Instead of the conventional ailerons, it has all-moving wing tips which serve both as ailerons and elevators. The usual tailplane and elevators are dispensed with, thus saving weight and drag. The loads which have to be carried by the fuselage are less severe and in consequence the download which normally occurs on the tail at high speeds has the desirable effect of reducing the bending moments in the wing spars. The flying advantage is that they prevent the tendency to tip stalling at low speeds. The rotating wing tips on the Sherpa comprise approximately one-fifth of the total wing area. They can be rotated either together or in opposition to act as elevators or ailerons respectively. They are hinged at about 30 per cent chord and each carries on its trailing edge a small anti-balance tab, the fulcrum of which can be moved by an electric actuator.

Power for the Sherpa is provided by two Blackburn Turbomeca Palas turbojets of 350 lb thrust each, housed in a fireproof dorsal bay. It is expected that the lessons learned from this research aircraft will provide data which will form the basis of future high-speed civil and military aircraft.

The Folland Midge, which is the research precursor of the Gnat fighter, is a reaction against the increasing weight and complication of the modern fighter. The Midge flown at Farnborough had a long-life Armstrong Siddeley Viper turbojet, of about 1600 lb thrust, but the final model, designated the Gnat, will be built around the Bristol Orpheus jet, with practically three times this thrust. The Midge is one of the smallest fighters produced, with a wing span of 20 ft, 8 in., length 28 ft, 9 in., height 8 ft, 9 in., and

undercarriage track 61 in. It has sweptback wings at 40 deg and an aspect ratio of 3.3. Advantages claimed are that tooling time for production is halved and twenty-five light fighters instead of five standard fighters can be built in the same number of airframe man-hours. The Gnat is a high-wing monoplane with a low-set tailplane of the power-operated "flying" type, and an unusual feature is the use of power-operated inboard ailerons which give an exceptional high rate of roll. Fairings are attached to all three legs of the tricycle undercarriage, and these act as air brakes when the legs are partially lowered and as doors when the legs are retracted. There is no change of trim when these air brakes are used. The wing is made in one piece and attached to the fuselage at only four main points. There are no guns, undercarriage or tanks in the wing, and engine removal requires only the separation of the rear fuselage from the center fuselage. The Midge was flown at 600 mph; the Gnat will be flying in about nine months time.

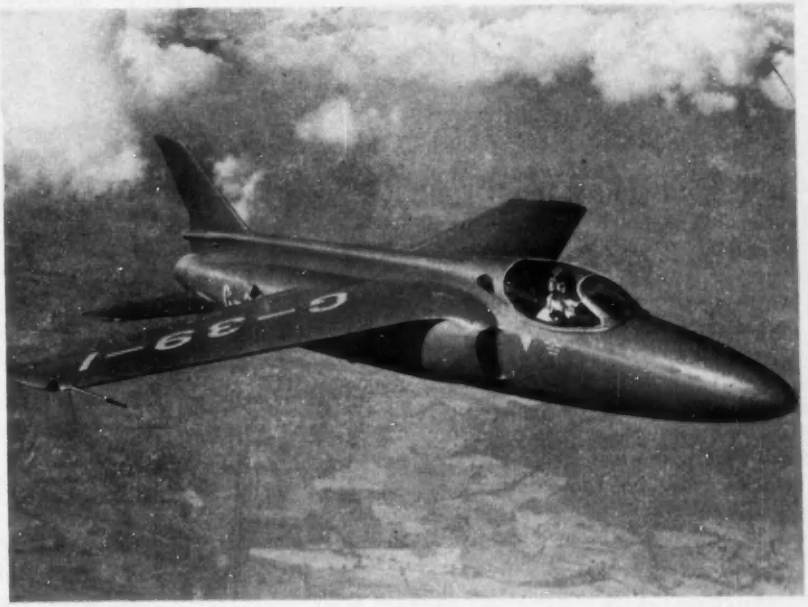
Boulton & Paul presented the P. 111 high-speed, tailless research aircraft with delta wings having a span of 33 ft, 6 in., a length including pressure head of 26 ft, 1 in., and a height of 12 ft, 6½ in. equipped with a Rolls Royce Nene turbojet. This machine has already done a considerable amount of flying and is capable of diving at supersonic speed.

The Avro Atlantic was shown in model form only, a civilian version of the Vulcan fighter and like it having delta wing construction. There are no indications that this four-jet-engine, 76-100 passenger plane, with a speed of 600 mph, has got beyond the drawing stage.

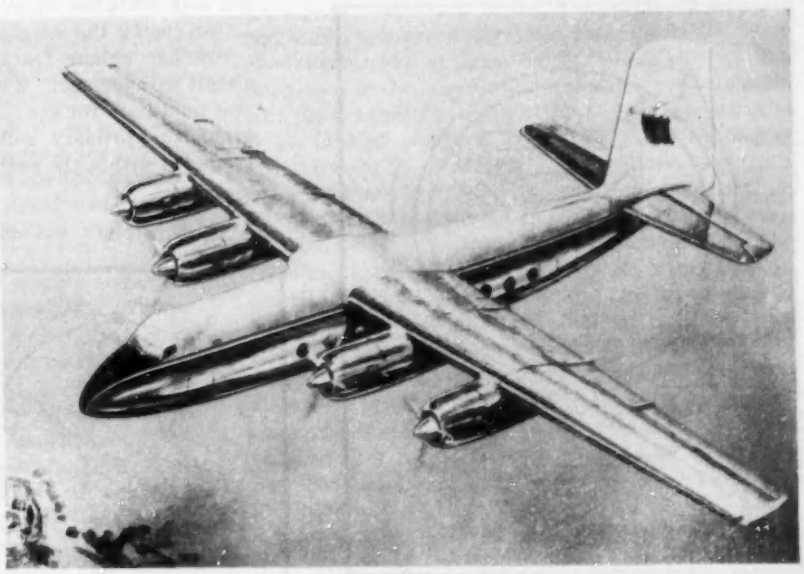
Permission was refused to present the English Electric P. 1 supersonic interceptor, equipped with two Sapphire turbojets, and the first British aeroplane designed to fly at supersonic speeds in horizontal flight. In order to get into the production stage as early as possible, twenty pre-production types have been ordered. This machine has already flown, but permission to display it at Farnborough was refused at the last moment.

Handley Page presented a new general-purpose airliner designated the Herald, of which two prototypes are in construction and which it is believed will be ready for commercial service in 1957. It is designed to operate as an airliner with 36 first-class or 44 tourist passengers, as a combined air-liner freighter, or solely as a freighter. The Herald is a

(*Turn to page* 92, *please*)

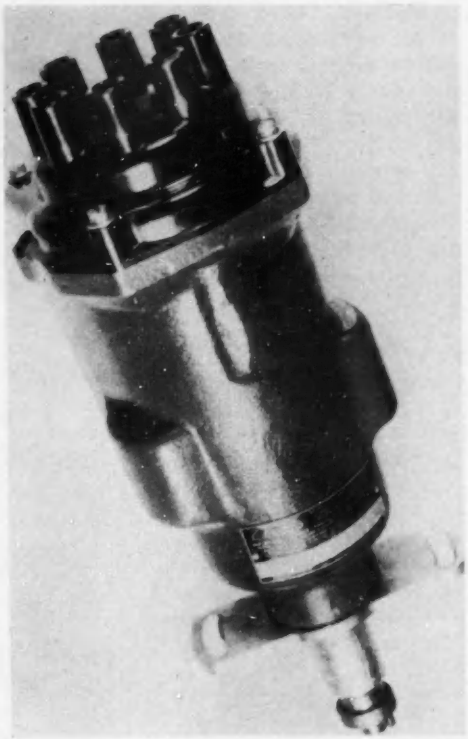


Midge light jet fighter built by Folland. Its engine is an Armstrong Siddeley Viper turbojet



Handley Page's new general-purpose transport, the Herald

New Magneto Uses Battery Current for Starting



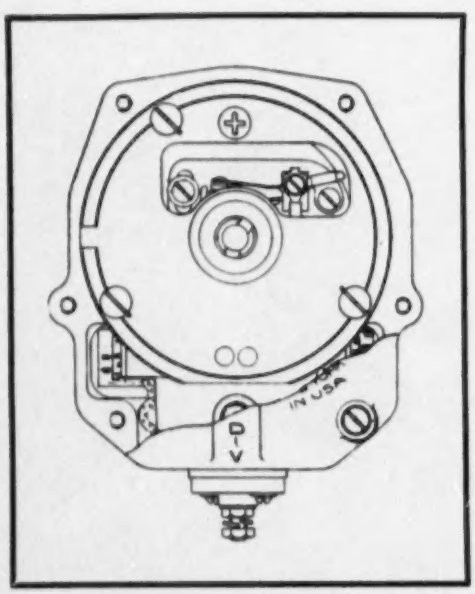
Bendix-Scintilla Automag for V-8 passenger car engines.

Now undergoing tests by some of the major passenger car and truck manufacturers is a new magneto designed particularly for high-speed, high-compression automobile engines. The magneto, developed by the Scintilla Div., Bendix Aviation Corp., Sidney, N. Y., especially for current V-8 type engines, provides the basic advantage of conventional starting and performance with an increasingly hotter spark for rapid acceleration throughout an engine's speed range.

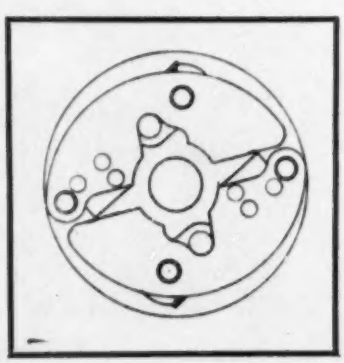
One of the major features of the Automag, as it has been named by Scintilla Division, is a new advance mechanism. The automatic advance is made up of two weights, one on each side of the magnet shaft, which are pivoted between a rotating plate and the rotating magnets. In operation, the centrifugal forces of the weights are balanced against the driving torque of the magnets and small leaf springs acting on the flyweights.

As shown in the accompanying illustration of the advance unit, the flyweights are pivoted on the driven disk. Links, one on each weight, are pivoted on the rotating magnet and the weights. As centrifugal force throws the flyweights outward, one end of the link pivots on the driving disk while the other end moves outward and ahead thereby advancing the weights and in turn the rotating magnet.

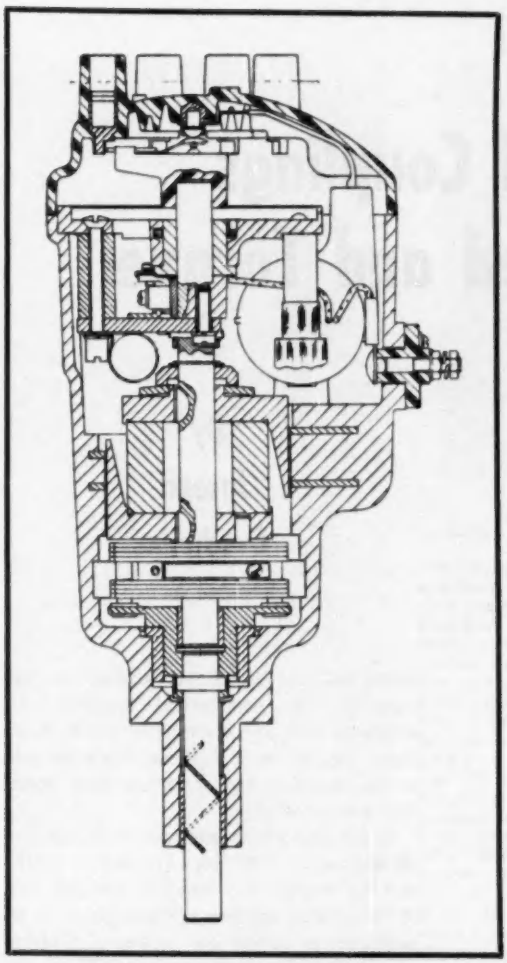
Another unique feature of the Automag is its starting circuit arrangement. With the special circuitry, battery current is utilized for the ignition. As shown in the wiring diagram, the primary coil winding of the magneto is not grounded within the unit as is a conventional magneto. This



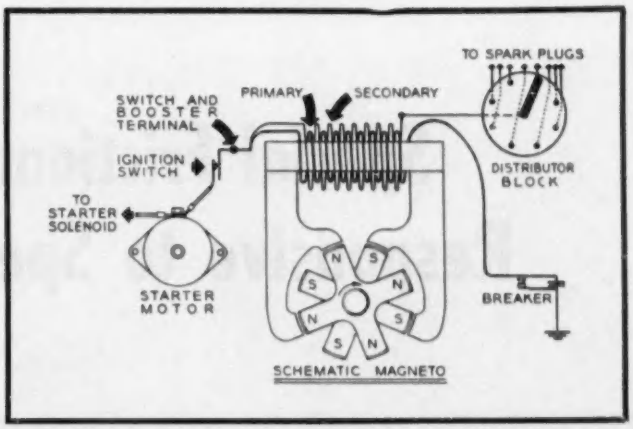
Automag timing mechanism.



Advance mechanism for counterclockwise magneto rotation looking from the distributor end. The centrifugal forces of the flyweights are balanced against the driving torque of the magnets.



Cross-section of an unshielded, counterclockwise rotation, Automag produced by Scintilla. Note the location of the advance mechanism and the timing unit.



Wiring diagram of the Automag shows how the unit is wired for battery ignition while starting.

lead is taken through the ignition switch and then to the starter motor terminal. This terminal furnishes battery current during starting and provides a ground when the engine is operating. Thus, with the starter switch on, battery voltage flows through the magneto coils in much the same manner as conventional battery ignition systems. Turning the ignition switch off breaks the magneto ground circuit.

The Automag uses a pivotless breaker similar to that used in Scintilla aircraft magnetos. The breaker cam has been placed between the shaft's supporting bearings. This has been done so that bearing clearances will have a minimum effect on its action. The entire timing mechanism, coil and condenser can be removed as a single unit for maintenance.

The Automag will be produced in both shielded and unshielded types. It will also be made in four-cylinder models for the military. Eventually, Scintilla will also provide an Automag for six-cylinder engines.

First International Instrument Congress

An estimated 20,000 engineers, scientists and technicians attended the ten-day First International Instrument Congress and Exposition in Philadelphia last month. They saw some 700 exhibits, heard over 225 technical papers, and attended clinics sponsored by the Instrument Society of America and 11 cooperating societies.

Computer data handling was discussed at several sessions. The Pratt & Whitney Syncro-Timer for sorting and indexing was described by A. S. Burgoyne of Pratt & Whitney. Data reduction at the Air Force Arnold Engineering Development Center was outlined in detail by A. H. Hodges and G. V. Schwent of ARO, Inc. Data processing by a single type of common language machine, as practiced throughout the U. S. Steel Corp., was outlined by L. W. Calkins of that company. Automatic digital recording was explained with an example of a typical jet engine test stand by W. G. Deutsch and L. V. Ottaviano of the Jet Engine Div., General Electric Co.

In other sessions, instrumentation of industrial air conditioning was surveyed by A. H. Koch of Minneapolis-Honeywell Regulator Co. Automobile crash-injury research instrumentation methods were pictured and described by D. L. Gerlough of the University of California. Miniature transducers for mobile test applications were summarized by O. W. Sailer of Consolidated Engineering Corp., while H. Landsberg of CEC discussed briefly mass spectrometer techniques in analyzing exhaust gases. Jet thrust measurement was discussed by H. A. Mills of the A. H. Emery Co. Specifications for dynamometer control were explained by Hal Gibson of General Electric Co.

Simulated service testing of earthmoving equipment was covered by A. H. Pickford, Caterpillar Tractor

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Special Frictional Couplings Responsive to Speed and Torque

By Joseph Geschelin

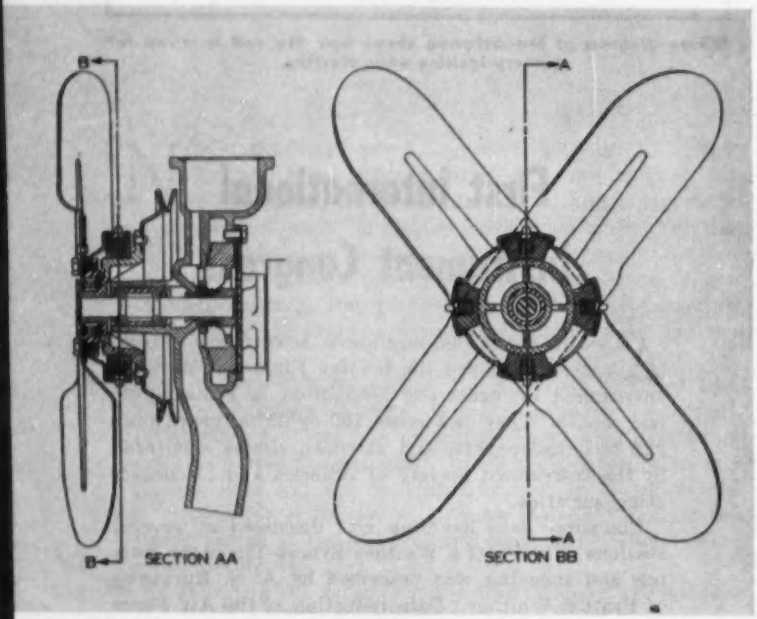

FIG. 1

Arrangement of Lipe-Rollway speed-torque meter coupling for controlling passenger car fan and water pump drive.

With the growing demand for improved vehicle lighting, and power actuated accessories such air conditioning, power steering, electric and hydro-electric window and seat actuation, electric windshield wipers, and the like, passenger car engines are festooned with a variety of power-consuming devices—all tending to increase the disparity between gross and net horsepower. When the cooling fan, water pump, and generator are added, it is obvious that the integration of the gamut of power-consuming devices plays a major role in reducing the usable power available at the road.

Exactly the same situation exists on other applications of automotive engines. Truck and bus engines require considerable power for driving the cooling fan and water pump, power steering, air compressor, and electric load. The difference is in degree. Heavy duty vehicles must be loaded to full capacity for economical hauling and available net horsepower is much more important since it plays such a vital role in maintaining high average road speed and gradeability.

A similar argument may be made for off-highway vehicles, tractors, earth-moving machinery, and the general run of industrial engine applications. It is particularly acute on military vehicles where electrical power demand is so unusually heavy due to the operation of many electronic devices.

Starting with this brief statement of a major problem, it is of interest that Lipe-Rollway Corp., Syracuse, N. Y., has been engaged in a study over the past three or four years, culminating in the development of a family of unique frictional coupling devices responsive to speed control and torque requirements. According to the company, these couplings are extremely flexible in application. As will be shown later, they can be applied to an individual accessory to limit maximum operating speed within the most efficient range; or a single coupling can be installed on the crankshaft end to provide speed and torque control for the entire accessory drive. This Lipe-Rollway coupling replaces the torsional vibration damper and is claimed to provide exceptional vibration control.

Lipe-Rollway engineers point out that the speed-torque metering coupling may be applied in such fashion as to improve the operating characteristics of a given accessory, increase its efficiency, and at the same time reduce materially the load on the engine. Let us consider a few specific examples:

1. When applied to the fan and water pump drive (see Fig. 1) it is feasible to introduce a higher

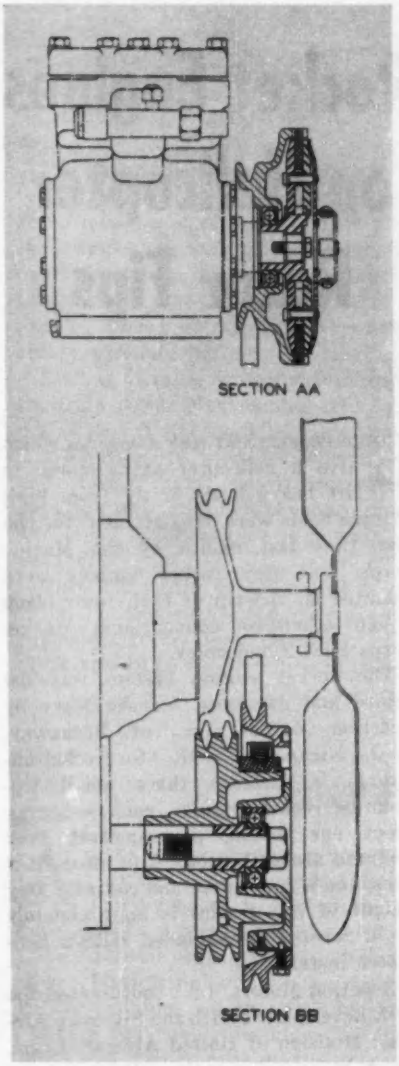

FIG. 2

One form of application of combination damper and speed - torque control device. The arrangement combines the damper, fan and water pump drive, and air conditioning compressor drive; however, in this instance, speed - torque control is applied to the compresser drive only. In addition, it will be noted that the compresser has been fitted with a manually - controlled off - on clutch.

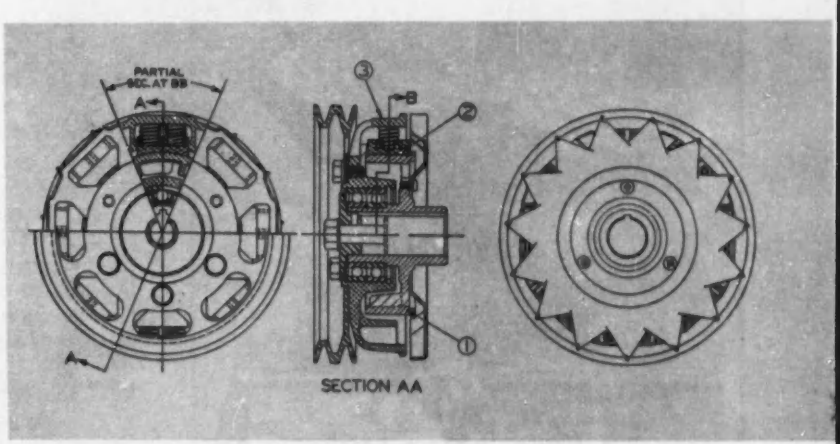

FIG. 3

Detail of construction of combination damper and speed-torque control coupling.

numerical ratio between fan and crankshaft drive to permit optimum cooling at low vehicle speeds and idling. Since the device also limits the top speed of the fan under all conditions, there is a substantial saving in power demand at high engine speeds. A plus advantage, in passenger cars particularly, is a marked reduction in underhood noise level.

2. If the coupling were applied to the generator alone, it would permit a higher numerical ratio, thus assuring maximum generator output at low engine speeds. At the same time maximum speed is limited to a specified value, thus reducing power drag and minimizing the effects of centrifugal force on the rotating mechanism.

3. The metering coupling also can be applied directly to an air compressor on trucks, buses, and other heavy duty equipment. Here the major problem is that maximum speed must be limited to a safe value. Usually this makes it necessary to gear down the compressor drive so as to limit top speed. But the result is said to be that compressors may provide inadequate air supply at low vehicle speed (as in city driving); furthermore, require time to build up reservoir pressure after the vehicle has been parked. Installation of the coupling is said to make it possible to increase the compressor drive ratio to say 1.2 times crankshaft speed while limiting top speed to say 2100 rpm.

4. Similarly, the coupling can be applied to the hydraulic pump for power steering on passenger cars, trucks, buses, and other heavy duty equipment. Here it is feasible to gear the pump so as to provide maximum output at moderate speeds, by torque control, and limit maximum speed at the same time.

5. As an example of the versatility of the coupling, it may be employed as a shock absorber or torque limiting device for the fan drive of an exceptionally large engine. In this case, the coupling absorbs all shock in the belt drive, making it possible to reduce the size of belt or number of belts ordinarily required for the same installation. It may be noted in this connection that on all applications noted above the coupling serves as a shock absorber, making it possible to reduce slack in V-drives, thus increasing mechanical efficiency considerably.

The foregoing has touched on a sampling of applications to indicate the general character and scope of this device. It is obvious, however, that maximum gain and economy from the standpoint of installation cost would be achieved if a single unit were to be applied at the drive end of the V-belt system. Figure 2 shows one form that could be applied to any kind of engine with speed-torque control on one accessory only, subject naturally to variations in accessory drive arrangement. Here a larger coupling is mounted on the end of the crankshaft, doubling in brass as a

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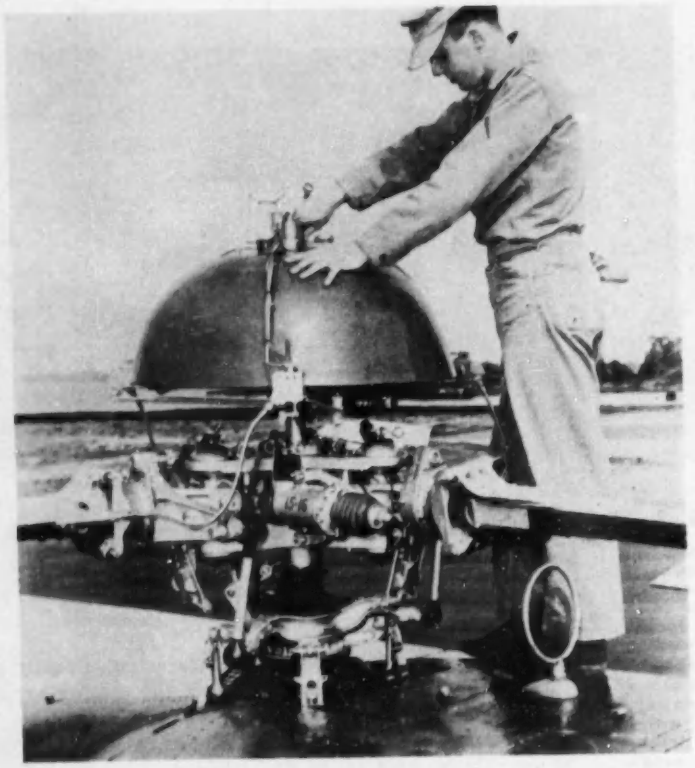
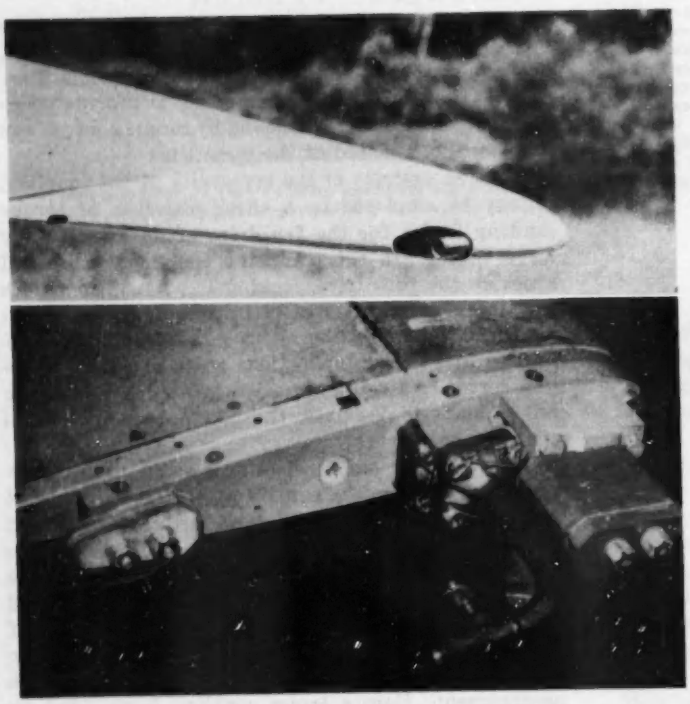
Rocket Engines on Helicopter Rotor Tips



ROR-powered helicopter carries fuel in dome-shaped tank mounted on top of rotor hub. Tank holds sufficient hydrogen peroxide for six minutes of operation, enough for 20 to 25 ROR assisted take-offs. Centrifugal force of revolving rotor blades automatically pumps fuel to rockets in tips.



Rocket engine installed in helicopter blade tip. With tip fairing installed, only exhaust RMI rocket on rotor is visible. Compact design results in no aerodynamic disturbance.

LIQUID-PROPELLANT rocket engines which give a helicopter extra power to lift heavy loads or fly from high altitude fields were demonstrated for the first time last month by the Marine Corps. The tiny rocket engines were mounted on the tip of each rotor blade of an otherwise conventional Marine Corps HRS-2 helicopter.

The rocket engine system was designed and developed for the Navy by Reaction Motors, Inc., of Rockaway, N. J. Nicknamed ROR (for rocket-on-rotor), it includes three small tip-mounted rocket engines, each weighing about one pound, a propellant tank mounted above the rotor hub, propellant lines, and a few valves and controls. Dry weight of the system is approximately 67 lb for the three-bladed HRS-2 helicopter installation.

Reaction Motors, Inc., coordinated the ROR development with the Sikorsky Aircraft Division of United Aircraft Corp., which manufactures the HRS-2 for the Marine Corps. The auxiliary power system was first test-flown by Sikorsky Aircraft on March 9, 1954. Since then it has been thoroughly evaluated by the Navy. It now appears that the ROR principle can be adapted to many existing helicopters with relatively minor alterations and resultant greatly increased performance.

Some of the benefits claimed for the new equipment are: the helicopter can take off at sea level with greater loads by using the ROR assist; ROR provides improved glide performance and control if the main engine fails; and ROR greatly improves rate of climb and hovering ceiling at any fixed gross weight.

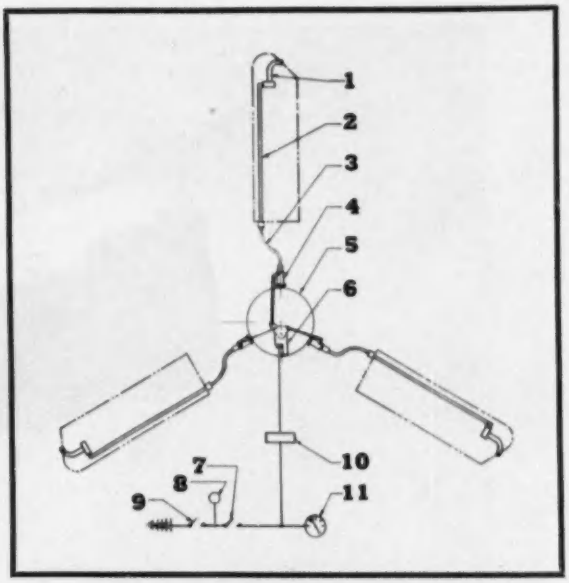
It is conservatively estimated that to provide a comparable increase in power through the installation of a larger main reciprocating engine, the engine itself

would weigh approximately 200 lb more. In addition, the entire power transmission system would have to be considerably strengthened to transmit additional power.

The round, dome-shaped tank which is mounted on top of the rotor system holds enough fuel for up to seven minutes of operation. This is considered more than ample for routine requirements during normal operations since the helicopter needs the ROR assistance only in take-off, hovering, or in autorotation conditions. Once underway with forward speed, its rotors create adequate lift.

ROR is of value during autorotation landings when the main power plant is shut off. In tests, power was out at 1000 ft and the ROR turned on at around 250 ft. The added boost, while insufficient to keep the 'copter in sustained flight, greatly decreased the glide angle, gave the pilot considerably more maneuvering ability and much wider latitude in choosing a spot on which to land.

Thrust from the rocket engine is created by a rapid catalytic decomposition of hydrogen peroxide—a monopropellant rocket fuel. Operation of the ROR system is claimed to be only barely audible and is not visible.



X96F3 ROR schematic diagram as applied to HRS-2 helicopter. (1) XLR32RM2 rocket engine, (2) rotor blade propellant line, (3) flexible line, (4) propellant control valve, (5) propellant tank, (6) propellant valve actuator, (7) firing switch, (8) arming indicator light, (9) arming switch, (10) slip rings, (11) timer.

• • •

Improved Suspension for Trailers

A RECENT improvement in Fruehauf trailers is the "Rubber Ride" tandem which incorporates several advances in leaf-spring tandem axle suspension. The new suspension uses rubber in place of metal-to-metal bearings, thus eliminating friction and wear; lubricating points also are eliminated. These rubber bushings act as equalizing elements.

There are rubber bushings on the bellcrank trunnions and rubber pads on the ends of the connecting rods. In addition to the rubber bushings, the slides in the elongated spring eyes are solid blocks of long-wearing, especially shaped nylon which is said to have almost unlimited life.

Better riding also is achieved by a lower center of gravity and a wider tread achieved by mounting the suspension outside the underconstruction sub-frame. Compensation for variation in the load is provided by

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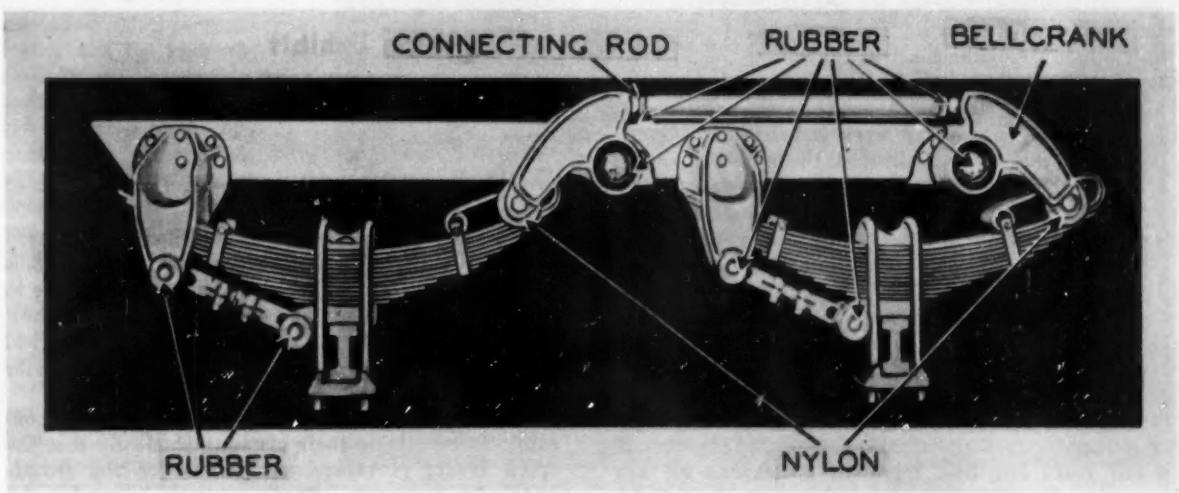


Nylon and rubber eliminate metal-to-metal action in the new Fruehauf leaf spring tandem.

1954 NATIONAL AIRCRAFT SHOW

Navy's tandem-rotor anti-submarine helicopter, Bell HSL-1, was displayed for the first time at the show.

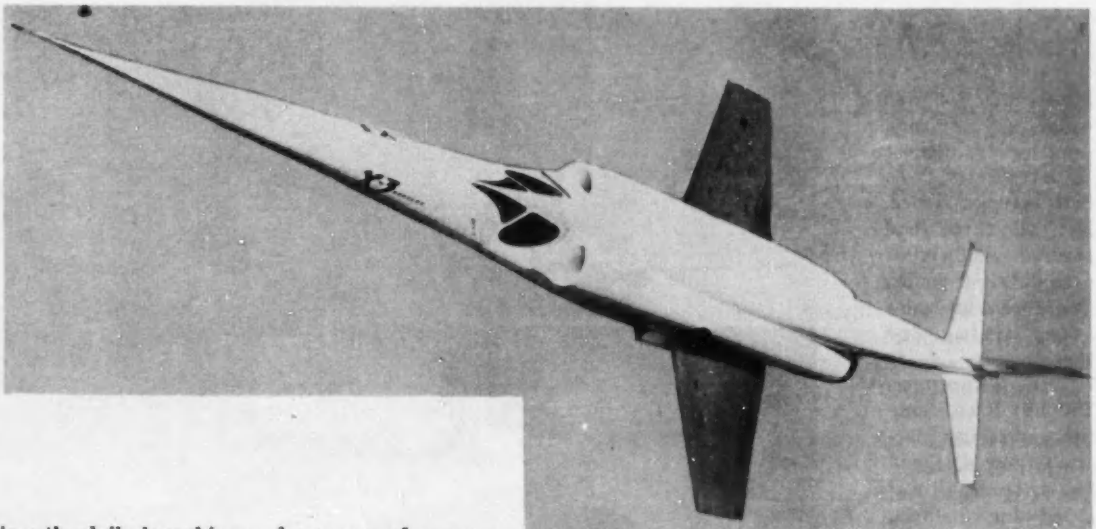
- **New Records Established**
- **Latest Jets Displayed**
- **Vast Array of Aeronautical Equipment on Exhibit**

THE fabulous advances in military aircraft performance are rapidly making the old-fashioned "air show" physically impossible and today's "air race" requires half the distance across the nation to provide elbow room for the contestants. The 1954 National Aircraft Show, held over the Labor Day week end, attracted crowds of an estimated 100,000 a day to the Cox Municipal Airport, Vandalia (Dayton), Ohio—yet the show management has already decided the Dayton area is too restrictive for today's jet aircraft. Next year's show may well he held in Texas.

The evolution of air racing since V-J Day has seen the end of privately-built racing planes roaring in bunches around pylons and today, instead, the events are fashioned to display the performance capabilities of current jet military aircraft. The static displays in the booths of manufacturers, virtually absent only a few years ago, now represent a complete air age education for the public (and expert, too) and the opportunity to inspect supersonic jet fighters on the ground at close range is a powerful instrument of public understanding.

New speed records were established at the 1954 show, as they have been every year. This simple statement, now so familiar, is a remarkable tribute to the aircraft manufacturing industry, which somehow manages to keep pushing through technological "barriers" as rapidly as they arise and produce superior models each year.

The Services, the show management, and the sponsors now coordinate their planning so closely that the speed events provide ample thrills for the crowds while simultaneously affording practical training for the participating officers and crews. Among many



Douglas X-3 experimental model, one of the most unusual planes on display in the static exhibit.

examples: the daily launching and recovery of a parasite fighter from a bomber, simulated fighter attacks on an enemy bomber and fast takeoff and climb maneuvers to stimulate interceptor missions.

The Bendix Trophy Race, once the domain of such immortals as Roscoe Turner and Jimmie Wedell, this year was made up of two pilots each from five different Air Force commands. All 10 pilots flew the new Republic F-84F sweptwing *Thunderjet* fighter, affording cross-country service testing of the machine at maximum performance. Because of its short range at maximum speed (at reduced speed it can fly coast-to-coast), the pilots landed for refueling en route, providing ground crew training in rapid fueling operations.

The 10 pilots were given their option of altitudes and frequency of fueling, although each command had its own crews standing by at designated fueling points for pilots of that command, and the race afforded an interesting example of the peculiarities of jet aircraft operation. Only two of the pilots elected to refuel twice, and one of them was Capt. Edward W. Kenny, Jr., the winner of the event. The choice lay between flying high at cruising speed and saving the lost time of descending, refueling and climbing or making both fuel stops and flying at maximum speed between landings.

Despite the apparent differences in these two methods, the pilots all finished within minutes of each other. Capt. Kenny was followed across the finish line only 2½ minutes later by Maj. Harry K. Evans, who refueled only once. Maj.

Operating models of pneumatic equipment built by the General Electric Company's Aircraft Accessory Turbine Department, Lynn, Mass., were displayed in a special exhibit.

Evans was followed only *six seconds* later by Maj. Robert L. Stephens, who had refueled twice. Yet all three had covered 1900 miles over different routes at different altitudes after flying for three hours.

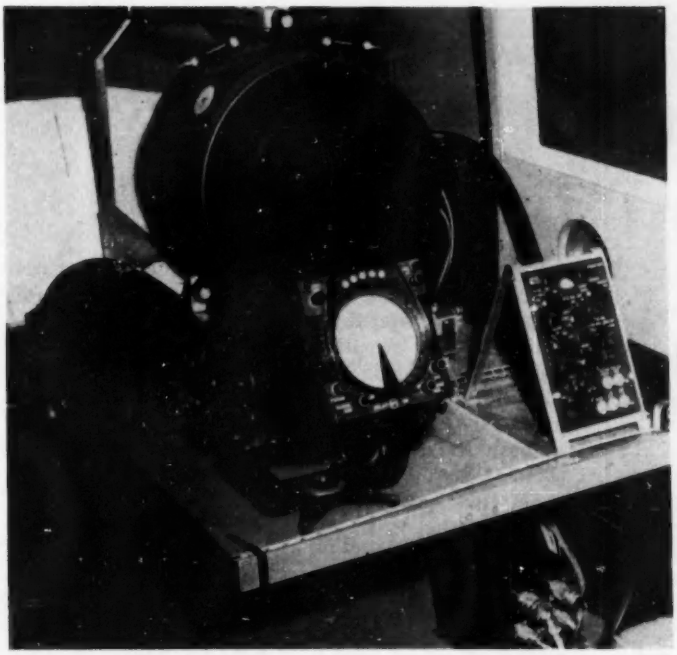
The Thompson Trophy Race, long the air racing classic, is now designed for international speed - for - distance record setting. The Federation Internationale Aeronautique, world record-keeping body, not only recognizes absolute airplane speed but the fastest speed over distances of 100 km, 500 km, etc. The 100 km closed course (62.137 miles) Thompson event was won by Capt. Eugene P. Sonnenberg flying a North American F-86H *Sabre* jet fighter powered by a General Electric J73-GE-3 turbojet engine of 9000 lb thrust. Flying alone, Capt. Sonnenberg averaged 692.823 mph for the circuit, an indication of the surprising improvement in speed of the *Sabre* fighter afforded by the new and more powerful engine. However, this performance is well below the world's record of 728.11 mph held by Douglas test pilot Robert O. Rahn in the Douglas F4D-1 *Skyray* Navy carrier fighter.

The General Electric Trophy was awarded for the best speed for five laps of the course to total 500 km (310.685 miles). This event also was won by the F-86H flown by Maj. John L. Armstrong with a world's record-breaking average of 649.302 mph, a substantial improvement over the previous record of 607.1 mph set last May by Capt. Anders Westerlund of the Swedish Air Force. Tragedy marred the 1954 show when Maj. Armstrong was killed the next day in an attempt to improve his performance. Jet fighters have a maximum speed rated in Mach number, which depends upon temperature for its "miles per hour" equivalent: the same Mach number will give a low mph reading on a cold day and a high mph reading on a hot day. The day after his record, the temperature soared to 99 F and Maj. Armstrong might have absolutely duplicated his performance and still produced a new record of 655 mph or so. However, his aircraft exploded about 10 miles north of the airport at low altitude.

Solar ground power unit for starting jet aircraft. It has a small gas turbine, as shown in inset.

The Allison Trophy was designed as a truly tactical test of the Northrop F-89D *Scorpion* two-man, all-weather fighter and was awarded to the team reaching an altitude of 10,000 ft in the shortest elapsed time. This event was won by 2nd Lieut. William J. Knight, pilot, and 2nd Lieut. William K. Sellers, radar observer, who reached 10,000 ft from a standing start in just two minutes seven seconds, indicative of the great climb of this afterburner-equipped twin-allison jet fighter.

The daily air performance was executed with incredible precision with the Air Force allotted 60 min, the Army 45 min, the Navy 40 min and the Marine Corps 15 min. The Air Force show featured "sonic booms" by a team of North American F-86F *Sabre* fighters in which the fighters attain sonic speed in a dive and pull out followed seconds later by sharp reports on the ground as the air compression in the wake of the diving planes reaches the ground. Other features were low passes by fighters which ignited their afterburners in front of the crowd and roared up into steep climbs with the aid of their powerful thrust augmentation, a formation of a dozen monster Douglas C-124 *Globemaster* cargo planes and the release of a Republic RF-84F *Thunderflash* swept-wing photo plane from the belly of a giant Convair B-36



Major units of new Sperry APN-59 radar which is compact enough to fit into single-passenger space. L to R, rear, are stabilizing gyro, and transceiver units; front, radar screen and sychronizer unit, and master control panel for many different uses.

followed by its recovery. Shown for the first time in a public demonstration was the supersonic North American F-100 *Super Sabre* swept-wing fighter, the supersonic Convair F-102 delta-wing fighter, the huge Boeing B-52 *Stratofortress* eight-jet bomber on its first trip away from its Seattle birthplace and the Martin B-57 Night Intruder. The Air Force static display also revealed the Martin B-61 *Matador* missile, the Bell X-1A supersonic research plane which holds the world's records of 1600 mph and 90,000 ft altitude, the Northrop X-4 research plane and the Lockheed RC-121 radar picket plane with its bulbous radomes top and bottom.

The Navy demonstrated for the first time in public its McDonnell F3H *Demon*, Vought F7U-3 *Cutlass*, the North American FJ-2 which is a carrier version of the *Sabre*, the swept-wing Grumman F9F-7 *Cougar* and the new Bell HSL anti-submarine helicopter. The Sikorsky HSS and Rotorcraft RH-1 provided helicopter demonstrations as well. The Navy flew its Lockheed P2V-7 with propellers feathered, sustained by its two Westinghouse J34 jet engines in wing-mounted pods, and its Goodyear S2G-2 airship.

The Army demonstrated its helicopters and liaison craft in simulated battle and assault tactics and showed the evacuation of wounded and the laying of telephone wire from the air.

The static displays were a fabulous array of the latest advances in aircraft electronics, accessories and equipment. Sperry unveiled its new Air Force APN-59 radar set, the smallest and lightest unit of its power and range yet developed. The equipment includes a "turtle shell" antenna, instead of the familiar parabolic "dish" shape, which is gyro-stabilized to remain in the same position despite unsteadiness of the airplane.

Aerojet-General Corp. displayed the French SNECMA jet "thrust reverser," which the former has obtained license to manufacture. This unit consists of a series of circumferential rings which are expanded to form a series of reverse paths for the jet exhaust. This device is becoming of increasing importance in the problem of slowing down jet aircraft to reasonable landing speeds and stopping distances.

General Electric Co. displayed its remote control tail turret system for the Boeing B-47 *Stratojet* six-jet bomber. The three-man crew of this bomber are located in the nose and the tail turret must be sighted

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MAJOR EVENT WINNERS

BENDIX TROPHY RACE

Edwards AFB, Calif. to Vandalia, Ohio—1900 mi

Capt. Edward W. Kenny, Jr. Republic F-84F Wright J65	**616.208 mph**

THOMPSON TROPHY

100 km — 62.137 mi — closed course

Capt. Eugene P. Sonnenberg, North American F-86H G.E. J73	**692.823 mph**

GENERAL ELECTRIC TROPHY

500 km — 310.685 — closed course

Maj. John L. Armstrong, North American F-86H G.E. J73	**649.302 mph***

ALLISON TROPHY

Fastest time from standing start to 10,000 ft altitude

Lieut. William J. Knight, pilot **Lieut. William K. Sellers, obs.**	**Northrop F-89D Allison J35**	**2 min 7 sec.**

* Indicates new world's record.

Aircraft Ignition Systems Chief Topic at Scintilla Conference

By Thomas Mac New

MAJOR theme of the three-day ignition conference held last month in Sidney, New York, by the Scintilla Div. of Bendix Aviation Corp. was improvements in aircraft ignition systems for the Pratt & Whitney R2800 and R4360 engines, and the Wright R3350 engine. Well over 100 persons representing most of the world's major airlines, U. S. military personnel, ignition manufacturers, and engine producers attended the meeting which dealt with their ignition problems. Both high and low tension ignition systems were discussed with the emphasis falling on the low tension, high altitude system.

Bendix personnel started the meeting by discussing the improvements sought in present day commercial and military reciprocating engine ignition systems. There were 10 major points brought out which Scintilla engineers are working on to improve current designs. These are as follows: easier accessibility, better wearing qualities, increased performance, improved lubrication, better sockets, leak prevention, improved carbon brush wear, corrosion prevention, better magnet balance, and improved ruggedness to withstand rougher handling.

Concerning cam and breaker points, it was stated that little is to be done on lubricants, but Bendix has improved cam finishes for longer operation. The cam follower height has been increased, and the oil felt has been improved, which shows a 100 per cent increase in service life on an experimental cam. Scintilla is currently working on different types of breakers and cams in order to achieve the goal of replacement only at full engine overhaul time. One of the new cams on test is an oil impregnated sintered type which shows some promise. This cam has less lift for the follower to open the points the same amount as previously specified for proper engine performance. The follower is made of a plastic material that is graphite impregnated. A number of these breakers are going out for tests by some of the major airlines.

Scintilla engineers are also working on carbon brush location in the distributor, since they are not entirely satisfied with its present location. A new distributor finger that utilizes a coil spring and dubbed by airline maintenance personnel the "mouse trap finger" is said to be more desirable than previous leaf spring or helical spring distributor finger. Several charts were shown which gave the test results of brush and finger wear. The biggest problem is brush burning.

A new distributor is currently being placed in production which utilizes a shock type mounting. Vibration is reduced by means of a torsional damper. However, this new unit requires considerable change-over for replacement on existing equipment.

Another new design of distributor which eliminates carbon brushes is undergoing test. Engineers working

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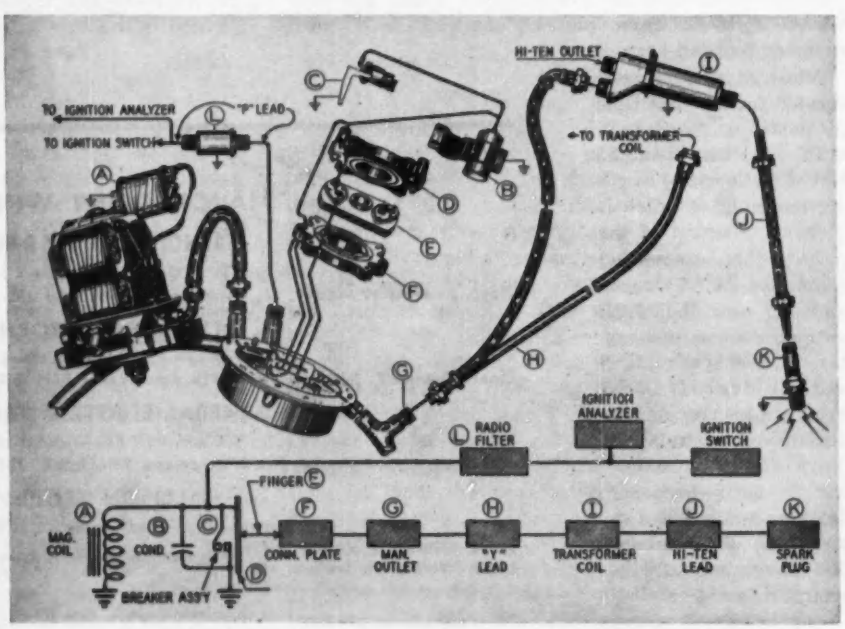


Schematic diagram of R-2800 low tension ignition system

Hydraulic Power Devices Analyzed at SAE Tractor Meeting

By Joseph Geschelin

ALTHOUGH hydraulic power devices have been employed in farm tractors and earthmoving machinery for some years, general interest on the part of the entire industry reached a high pitch at the SAE National Tractor Meeting held in Milwaukee last month. Three of the 13 papers on the program dealt specifically with hydraulic mechanism of one kind or another.

Since the introduction of Production Forum sessions a few years back, this feature has become one of the highlights of the tractor meeting. The one-day session at this meeting drew an attendance of over 700 people, exceeding last year's draw by at least 40 per cent.

In view of the interest in hydraulic equipment, some comment will be made here on the three papers. As pointed out by the several authors, the preferred system for earthmoving machinery employs hydrostatic equipment with pumps and motors in contrast to the hydrokinetic transmissions used in motor cars and road vehicles. A round-up of typical applications was given by H. V. Parsley, International Harvester Co., in a paper titled "Hydrostatic Transmission in Earthmoving Equipment." Among the distinct advantages of such devices are: extreme flexibility of installation; ability to preset or vary under load; precise control; smooth, uninterrupted variations in speed and torque ratios.

The author also described the development of a hydraulic steering arrangement for an IH four-wheel rubber tired tractor using a skid steering principle.

Specifically on the subject of power steering, Hess, Ethrington, and Giertz, of John Deere predicted acceptance equal to that on passenger cars, with the probability that an even greater percentage of farm tractors will be equipped in the future. The fact is that operators of farm tractors can derive even greater benefits than does the owner of a passenger car since the tractor system can make it easier to handle the heavier, front mounted implements in addition to the operator comfort inherent in power steering. The authors then describe the design details of a power steering system developed by them, employing a vane type steering cylinder.

The third paper, presented by J. R. Thomas, Thomas Hydraulic Speed Controls, dealt with the application of the VariDraulic drive—a hydrostatic type of coupling. Although this unique transmission unit has been applied in many ways, the latest and most intriguing application for farm and industrial tractors is in conjunction with a conventional Hydra-Matic transmission. It was found that by manually controlling output torque and speed of the VariDdraulic drive, the Hydra-Matic could be caused to up-shift and down-shift through all its gear changes. By holding VariDraulic controls at partial engagement, its inherent yielding characteristics permitted torque-load changes on the Hydra-Matic output shaft, causing the latter to up-shift with decreasing loads, down-shift with increasing loads.

Stemming from the harrowing experiences of the Armed Forces during WW II in the procurement and stocking of engine spare parts, has emerged a project of incalculable value to the national defense. The standardization of military industrial engines, described by J. H. Horton, Engineer Research and Development Laboratories, Fort Belvoir, Va., already has reached a decisive stage through the cooperation of commercial engine builders and parts suppliers working jointly with the Armed Forces. Started six years ago, this project was based upon standardization of high mortality parts, designed to reduce the number of such parts required for the gamut of engines to be procured from commercial engine builders. By reducing the number of basic bore sizes, interchangeability already has been effected for pistons, rings, piston pins and bushings, valves, connecting rod and main bearings.

An article devoted to this standardization program appeared in the Sept. 15 issue of AUTOMOTIVE INDUSTRIES.

Attention now is being directed to standardization of all manner of engine accessories — governors, carburetors, oil filters, magnetos, generators, etc.

The next major attack is being aimed at Diesel engines. Here the problem is considerably more complicated because of the variety of combustion chambers designs that require special piston formations; also complications due to the employment of four-stroke and two-stroke systems.

It is important to note that standardization will be employed only for the military program. Engines for normal commercial use continue without change.

The net effect of the program will be a reduction in the number of spares, a big reduction in inventories and stocks in the field, a tremendous saving to the

(*Turn to page* 102, *please*)

Reverse Thrust Developments For Jet Transports

By Joseph Sutter
Boeing Airplane Co.

ABOUT the time serious design studies of jet transports were started in the United States, a new device for assisting in the landing deceleration of present day transports was being introduced into every day airline operation. This was the reversible propeller. At the present time, reverse thrust has been accepted as a well proved safety feature. The last several hundred transports delivered to the military services and the airlines have reversible propellers as standard equipment.

The following figures show why reverse thrust is regarded with such universal enthusiasm. Figure 1 shows the landing roll for a present day transport landing on the minimum length runway allowable for the airplane under present airworthiness standards. A dry concrete runway is assumed and brakes only are used to stop. Under these conditions, an adequate margin in stopping distance exists. Figure 2 shows a similar condition except an icy runway is assumed. Here a large part of the margin is used up.

The third figure shows the effect of applying reverse thrust after landing on an icy runway. The margin in stopping distance is more than equal to that achieved on a dry runway using brakes alone.

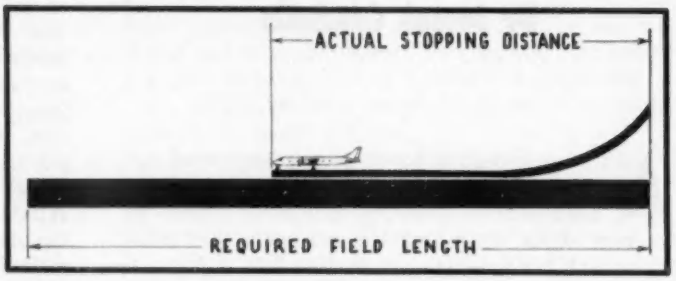


FIG. 1

Landing roll for reciprocating engine powered transport—dry runway, brakes only

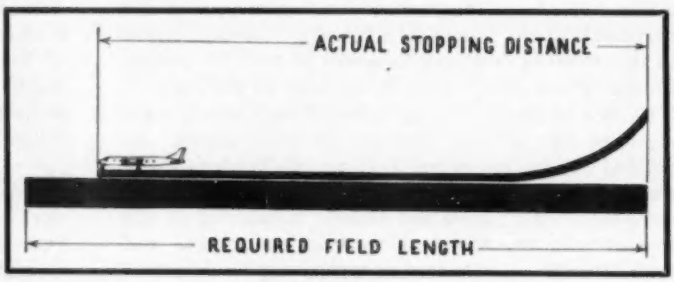


FIG. 2

Landing roll for reciprocating engine powered transport, icy runway brakes only

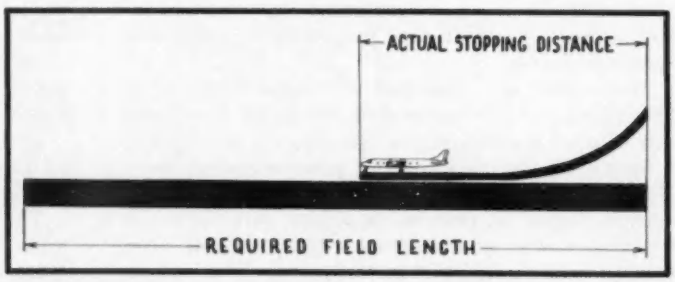


FIG. 3

Effect of applying reverse thrust plus brakes after landing on an icy runway with a reciprocating engine airplane

We now come to the jet transport. Fairly complete design studies have shown that a well-balanced economical jet transport will be able to land and stop in the same distance as contemporary transports on a dry runway. However, any future transport will be required to continue to operate during all types of weather and runway conditions. The incorporation of additional stopping devices in jet transports will be necessary to achieve this "all weather" capability.

Several methods have been developed to improve

FIG. 4

Drag-chute installation on B-47 medium bomber

stopping capabilities of airplanes without propellers. One of the most noteworthy is the drag chute. Figure 4 shows a typical chute installation on the B-47 medium bomber. This device has proved to be quite successful in military operations. However, the chute does have limitations which reduce operational flexibility. Not the least of these is that once the chute is deployed, facilities outside the airplane are necessary to handle it. Another disadvantage of the chute is that it has to be deployed quite close to touchdown to be fully effective since the drag effect is a function of airspeed. The chute becomes least effective near the low speed end of the ground roll, which may be the point at which maximum braking is needed.

After studying various stopping methods, it was concluded that reverse thrust would have to be developed for jet engines if jet transports are to have the operational flexibility of present day transports.

At this time a program to develop a jet reverser was instigated with the establishment of a set of design objectives to be followed by the designers. The most important of these are: (1) inherent safety and reliability, (2) stopping comparable to present day equipment, (3) ground run control only, and (4) no effect on engine operation.

The primary objective was to achieve a device inherently safe and reliable. It was desired that these qualities should be achieved through basic design and simple structural locks. The use of electronic controls and intricate protective devices was to be avoided.

The second objective was that the airplane with jet reversing should have operational flexibility comparable to present transport equipment. It was felt that this would be achieved if on an icy runway the airplane could be stopped with brakes and reverse thrust in the same distance it could be stopped with brakes alone on a dry runway. Analysis indicated reverse thrust in the order of 40 per cent of maximum forward thrust would be required to meet this objective. Third, it was specified that reverse thrust should be used for ground run control only.

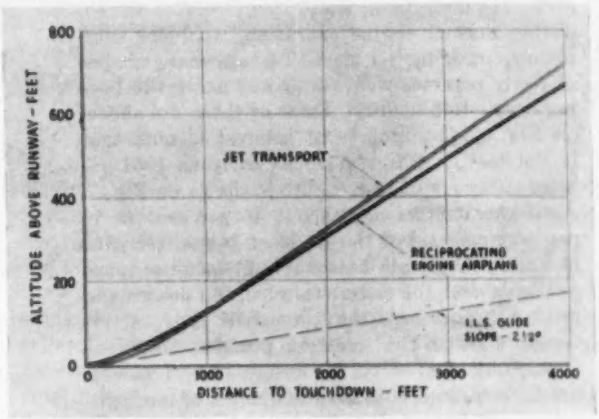


FIG. 5

Maximum glide paths of typical jet transport design and reciprocation engine transport

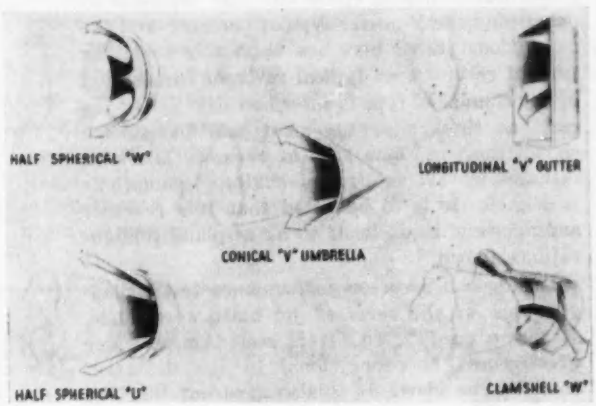


FIG. 6

Some of the likely reverser shapes which underwent tests at Boeing

Using reverse thrust for glide path control could increase the probability of failure in flight. Since the basic glide path control of a jet transport can be quite satisfactory, in-flight reverser operation was ruled out to insure the simplest device possible. Figure 5 compares the maximum glide paths of a typical jet transport design to a reciprocating engine transport. Both

airplanes are on the landing approach with flaps and gear extended and power off. The jet transport design shown incorporates aerodynamic drag brakes which provide increased drag comparable to that available from the windmilling propeller. The glide paths shown are about a slope of 1 to 5 which is considerably steeper than the normal approach which lies between the ILS approach and a slope of about 1 to 10.

The fourth objective requires that the reverser should not affect engine economy when the reverser is not in operation. In addition, the reverser should not adversely affect engine life or engine control characteristics when in operation.

In proceeding with the design, objectives (1) and (4) immediately indicated a device which, during normal engine operation, would be completely out of the jet blast. Tests of many shapes of likely reverses were conducted using the Boeing nozzle test facility. Some of these are shown on Fig. 6. It might be of interest to note that initial testing was started as early as 1951. A brief summary of test results is shown on Fig. 7. As shown on this plot, about 45 per cent to 50 per cent reversal of the jet blast is possible with reversers that could reasonably fit into the space available near the engine tailpipe. As design and testing progressed, the clam-shell type of reverser showed the greatest promise from the standpoint of meeting the design objectives outlined above, and from the standpoints of mechanical simplicity, installed weight and airplane stowage.

Although the remainder of this article is primarily concerned with this type of reverser, a great deal of design effort was also expended in developing the V-gutter type of reverser, and the conclusions stated here are applicable to either type of reverser. A typical reverser installation of the clam-shell type is shown on Fig. 8. Details such as linkage arrangement and baffles are shown therein. This type of reverser is shown installed in various airplane-engine combinations in Fig. 9. It is to be noted that this reverser arrangement lends itself to all airplane configurations shown.

During the reverser performance tests, shadowgraphs of the reversed jet blast were made, as shown on Fig. 10. It is seen that reverser effectiveness is proportional to the deflection angle of the blast. It is also apparent that the blast clears the adjacent structure by a considerable margin. Further work is proceeding to determine the effect of the reversed blast on other areas of the airplane and on debris pickup characteristics of the blast. These effects, of course, will be greatly influenced by each particular airplane design.

The clam-shell or V-gutter reverser can have no effect on engine characteristics during normal forward thrust operation since no part of the device extends into the jet blast. Scale model tests simulating the reverser also show that engine accelerating characteristics are not affected. Engine operating conditions are not changed in that the effective tailpipe area is unchanged at normal pressure ratios corresponding to full power.

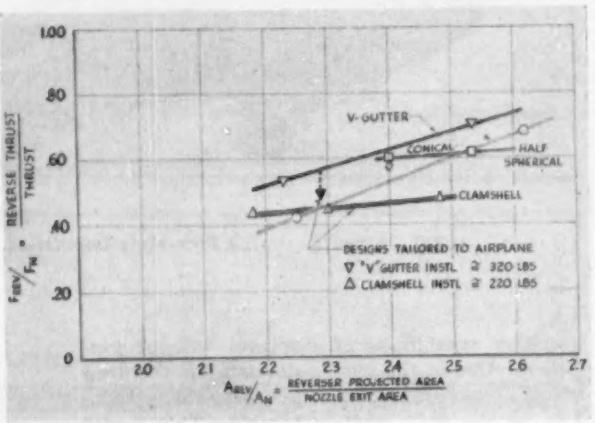


FIG. 7
Summary of tests of reverser performance

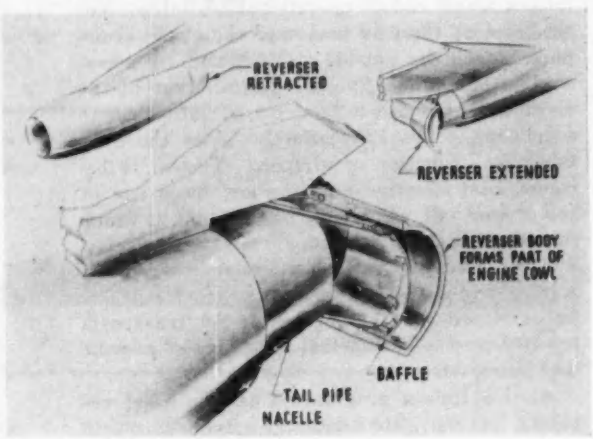


FIG. 8
Typical clam-shell type reverser installation

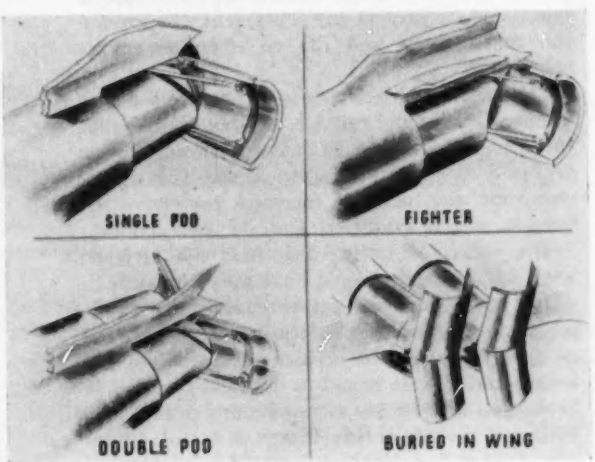


FIG. 9
Reverser installed in various airplane-engine combinations

A reverser of the type shown would give a typical jet transport stopping capability on smooth ice as shown on Fig. 11. It is noted that objective (2) has been achieved—that jet transport stopping capabilities under all conditions would be consistent with the dry runway brakes alone stop.

At this point of testing and design, sufficient progress had been made such that a fairly detailed airplane installation could be developed. Estimates resulting from this work indicate that a four-engine installation would weigh about 800 lb, a two-engine installation about 400 lb. With extensive development and operating experience, this weight would undoubtedly be reduced.

A thorough analysis of the reverser in regard to failures and malfunctions was also made to insure that the reverser would meet the basic objective of safety and reliability.

FIG. 10
Path of reversed jet blast

Those close to the development of the reversible propeller can remember the many difficulties experienced in the early development of this device, which have now been largely overcome. In evaluating the safety and reliability aspects of the jet reverser, it was felt that the jet reverser system should be at least as reliable as the reversible propeller in its present state of development. A failure analysis was therefore made where the two reversing systems are compared. All conceivable types of failure were considered which could be attributed either to the reversible propeller or the jet reverser. It was necessary that a common basis of comparison be available for this analysis. Therefore, the results of the analysis are shown in terms of a "severity factor." A severity factor of unity would mean that for that particular combination of airplane, flight condition and failure, the effect of the failure would be the same as if a single engine failure occurred. A severity factor of two would mean that the effect of the failure would be as severe as losing twice the thrust of one engine.

Reversals occurring during takeoff and cruise were analyzed. Figure 12 covers the takeoff situation with the airplane near the "unstick" point. The left hand column shows the present propeller driven airplane, the right hand column the jet airplane. Condition 2 for the propeller case is shown as a reference point since it represents the most severe failure which could occur if reversing were not incorporated in the propeller system. Condition 3 represents the first failure condition involving the reversing feature; and is the most critical condition. Not only is the effect on performance and control very severe, being in the order of magnitude comparable to a double engine failure at takeoff; but a very high propeller overspeed would result. Condition 4 shows that cutting power on the engine would alleviate the condition, but only slightly since most of the drag is produced by the high induced lift of the blades in flat pitch rotating at high rpm.

Conditions 5 and 6 show that if the propeller passes through the flat blade condition the reversed propeller condition is somewhat more tolerable. However, the condition is still 30 to 40 per cent more critical than a single engine failure where the propeller feathers.

Condition 2 for the jet-reverser failure represents the most critical failure which can occur with this

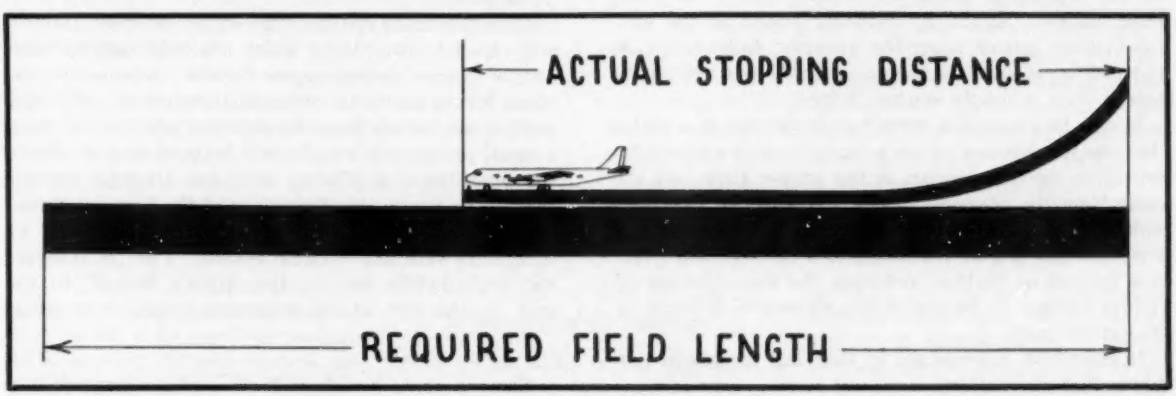


FIG. 11
Stopping capacity on smooth ice of four-engine jet transport using brakes plus reverse thrust

system. With the engine operating normally, the reverser fully extends into the jet blast. This type of failure is one and one-half times as severe as a single engine failure.

Condition 3 shows the effect of cutting power on the engine with reverser failure. Since the reverse thrust is directly a function of engine power, the consequences of the failure can be readily reduced by this means.

A similar failure analysis is shown for the cruise condition on Fig. 13. Again, condition 2 in the left hand column represents the most severe case for a propeller driven airplane not equipped with reverse thrust. This condition would result in a large reduction in cruising speed to reduce wind-milling drag and propeller overspeed. Condition 3 represents the most severe failure with a reversible propeller and would mean a very high overspeed condition as well as a

	REVERSIBLE PROPELLER	
	Condition	Severity Factor
1.	POWER FAILS PROP FEATHERS	1.0
2.	POWER FAILS – PROP TO LOW PITCH STOP	1.2
3.	PROP FAILS – POWER NORMAL – PROP TO FLAT PITCH	2.5
4.	POWER OFF – PROP TO FLAT PITCH	1.9
5.	PROP FAILS – POWER NORMAL – PROP TO REVERSE PITCH	1.4
6.	POWER OFF – PROP TO REVERSE PITCH	1.3

	JET REVERSER	
	Condition	Severity Factor
1.	POWER FAILS REVERSER RETRACTED	1.0
2.	REVERSER EXTENDED ENGINE NORMAL	1.55
3.	POWER OFF REVERSER EXTENDED	1.05

FIG. 12
Failure analysis—takeoff

critical performance and control condition. Condition 4 shows that after passing through flat pitch, the reversed propeller condition is still somewhat more critical than the low pitch stop condition.

The most severe jet reverser failure is that where the reverser fully extends into the jet blast with power on the engine, as shown in Condition 2 in the right hand column. Again, by reducing power on the malfunctioning power plant the reverser failure can be reduced in severity to become only 30 per cent more severe than a simple engine failure.

It can be concluded from the foregoing two tables that the jet reverser offers a basically safe method for providing reverser thrust at the proper time. At the same time the consequences of uncontrolled reversals which might occur due to malfunctions are minimized. The fact that engine throttling is a positive and effective method of further reducing the consequences of failure appears to be one of the attractive features of the jet reverser.

It should be emphasized in studying the above two tables that the failures analyzed have a very low incidence rate, judging by experience gained with reversible propellers during the last few years. However, there are failures which can happen if various serious malfunctions occur. In the case of the reversible propeller, systems which must operate continuously during normal flight are also used to control the reverse thrust cycle. Therefore, exposure to malfunctions exists during the entire flight. The jet reverser and control are separate from the basic forward thrust system. Therefore, the system can be effectively disarmed except when reversal is required. Exposure to malfunction can be greatly reduced.

It has been the purpose in the foregoing to discuss some of the results of the testing and design work leading to the present state of development of jet reversers. It appears that a practical jet reverser installation can be available in the near future which will give jet type airplanes the operational flexibility enjoyed by present day reversible-propeller-equipped aircraft.

	REVERSIBLE PROPELLER	
	Condition	Severity Factor
1.	POWER FAILS PROP FEATHERS	1.0
2.	POWER FAILS – PROP TO LOW PITCH STOP	3.2
3.	POWER FAILS – PROP TO FLAT PITCH	15.0
4.	PROP FAILS – POWER NORMAL – PROP TO REVERSE PITCH	5.3

	JET REVERSER	
	Condition	Severity Factor
1.	POWER FAILS REVERSER RETRACTED	1.0
2.	REVERSER EXTENDED ENGINE NORMAL	2.1
3.	POWER OFF REVERSER EXTENDED	1.3

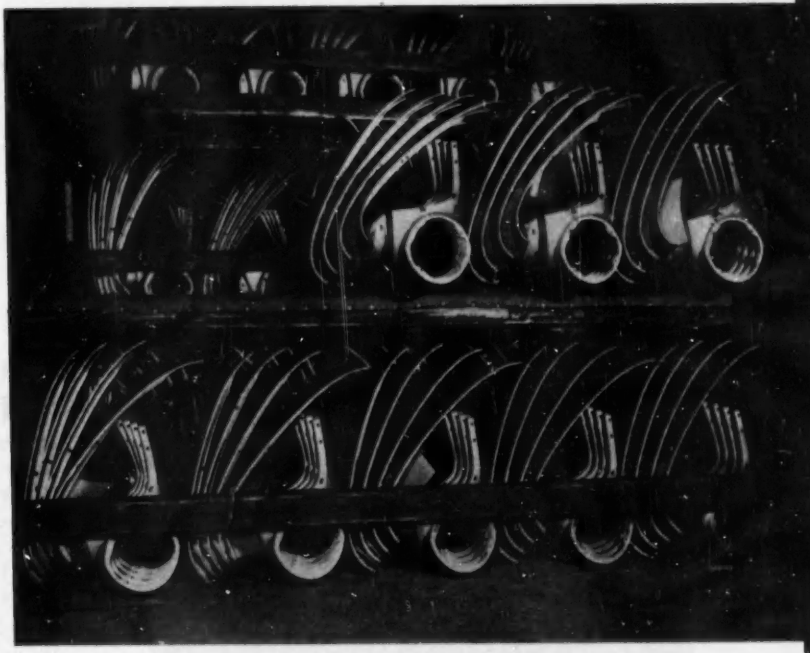
FIG. 13
Failure analysis—cruise

The type of reverser design discussed herein will not decrease engine fuel economy and can be adapted to a wide variety of engine installations. Because the jet reverser is separate from the basic engine, the consequences of reverser failure are considerably less severe than comparable failures of reversible type propellers.

Even the most critical type of jet reverser failures will result in conditions which are only slightly more severe than a simple engine failure. Because jet reverse thrust has to be obtained through an additional mechanism, rather than through the basic power plant, a small increase in weight will be necessary to obtain the operational flexibility available through reverse thrust. However, the separation of the forward thrust system and the reverse thrust system results in an inherently safe and reliable system. The jet reverser will undoubtedly become the "pilot's friend" in the near future, just as the reversible propeller is today.

The foregoing article is from a paper presented by the author at the 1954 National Aircraft Meeting of the SAE in New York.

New Shipping Method Prevents Damage to Fenders



View showing Ford method of nesting fenders in freight cars for shipment to assembly plants. Note fenders in upper rows resting on heavy felt pads described in text.

ALTHOUGH the versatility of felt has been recognized in the automotive industries, Ford Motor Co. recently uncovered an application of unusual interest which solved a troublesome problem. One of the projects of recent origin was to develop a method of shipping fenders by rail from the Metal Stamping Division to the various assembly plants that would prevent damage in loading and in transit.

From the standpoint of economy, fenders were stacked in box cars in such fashion as to utilize all available space. This was facilitated by a system of 4 by 4 in., 9-ft long wood dunnage bars hooked across the width of the car on steel belt rails running the length of the car.

Following several attempts at strapping the fenders in place, Ford engineers tried covering the dunnage bars and belt rails with felt and rubber. Rubber had a tendency to leave scuff marks on the metal and, in addition, produced a friction surface that made it difficult to load and unload the fenders.

Latest development is the adoption of a specification felt lining for dunnage bars and belt rails. Felt has none of the disadvantages experienced with the other materials and has the additional advantages of greater tear resistance as well as ease of forming over the dunnage bars.

In cooperation with Ford engineers, the Western Felt Works recommended use of its felt material made to an SAE F-7 specification for this purpose. This type of felt is tougher than pad felts, less expensive than backcheck felts. The material is being supplied in two different sizes—one for dunnage bars; the other for belt rails.

For dunnage rails, the felt strip is 7 in. wide by 108 in. long by ½ in. in thickness. This standard strip is sufficient to cover the entire length of the bar and wide enough to overlap each side of the bar, permitting nailing or stapling. In addition, it serves to pad sharp corners. Each DT & IRR boxcar is fitted with 62 bars, 32 of these requiring the felt covering. Three hundred and fifty cars are being fitted in this fashion, requiring some 100,800 ft of felt.

Belt rails take felt strip 6 in. wide by 48 in. long by ⅛ in. thickness. Lighter material is used in this application since it is not required as a padding against shock but only to prevent rubbing against the steel belt rail. These strips are glued to the rail.

It is interesting to note that despite the severe usage to which the felt padding and lining is subjected, it is not considered as being expendable in the sense that it must be replaced frequently. It is too early, however, to estimate the useful life. In any event, this method already has proved its utility by reducing sheet metal damage to the minimum.

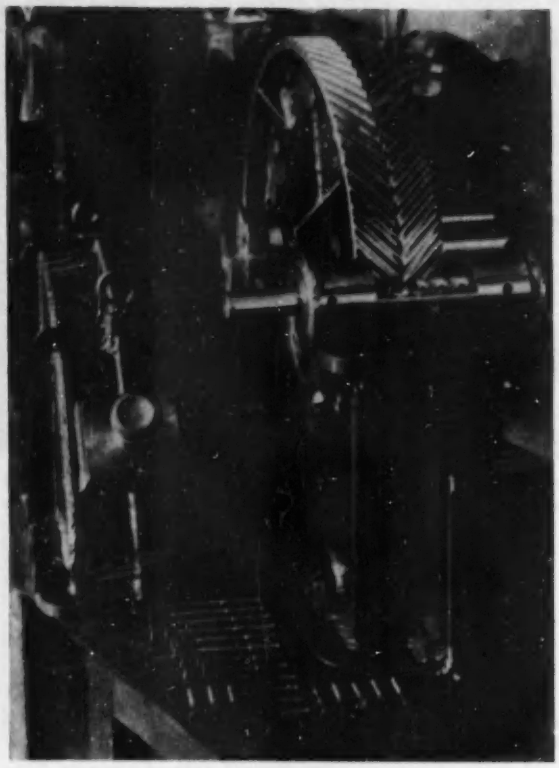
• • •

Air Intake of Car Engines Is Measured by 'Isotype'

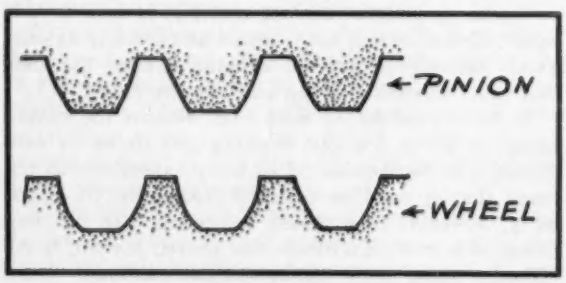
An "isotype" of radium that can be handled safely is being used by Ford in an instrument to measure the amount of air that engines use at high speeds in tests conducted at Dearborn, Mich. The radiation, it is said, affects the air passing between a series of plates in the instrument before entering the engines being tested.

Electronic devices measure the flow of air by showing how many tagged particles have been swept "downstream" to another series of plates. The instrument, called the anemometer, "dusts" the air with radioactive particles and measures how fast the air is "cleared."

High Efficiency Claimed for Italian Gear Design



SIRA reduction unit using double helical gears with teeth of special trapezoidal form.



Tooth forms of the SIRA gear.

GREATER load transmission and higher ratios in less space, and increased mechanical efficiency, are claimed for the gear design developed by the SIRA Society of Genoa, Italy. The system comprises a wheel and pinion of single or double helical form with trapezoidal tooth section. Principal feature is that the pressure angle and normal pitch of the two gears are different, although their linear pitches are always the same. Full tooth contact is maintained since the zone of engagement is slightly offset from the center line of the two wheels.

Reduced friction and exceptionally high efficiency are said to result from the fact that several teeth are always in mesh at any one time. Power-handling capacity is raised further by the unusually thick tooth root.

As an irreversible gear the SIRA design is claimed to have several advantages over a worm drive. Mechanical efficiency is reported to be about 0.72 per cent. Parallel axes of the two wheels permit more compact reduction units. There is no limit to the reduction ratio, it is stated, and even 1 to 1 is possible. When torque is applied to the driven wheel the pinion locks, and no movement takes place.

Successful applications in Italy include elevating mechanisms for naval guns, rotary drives for radar equipment, cranes, elevators and winches. An irreversible rack and pinion is now under construction.

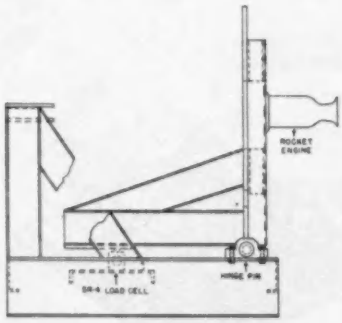
Applied to reversible gears, the SIRA design is said to allow a smaller diameter wheel for a given pinion size and reduction ratio. One example cited is a single-reduction unit of 1 to 40 ratio driven at 2000 rpm by 20 hp. The SIRA system required a gear wheel of only 17 in. diameter. An experimental 1 to 20 reduction unit transmitting 15 hp had a brass wheel of 19 in. diameter and steel pinion of 1¾ in. dia. Mechanical efficiency was claimed to be 95 per cent without excessive heat or noise.

• • •

Ford Car Steering Gears Undergo 'Torture' Test

Automobile steering gears are undergoing grueling durability tests at Ford Motor Co. In the company's body and structure laboratory, an 800-pound load hits the steering mechanism more than one million times in succession to simulate rough road conditions as actually experienced.

The steering wheel itself is spun for 25 hours by a special machine. To further check the steering rod, a 300-lb weight is swung against it, providing a shock comparable to striking a high curb at high speed.



This diagram shows the principle of measuring rocket engine thrust.

Measuring and Recording Rocket Engine Performance

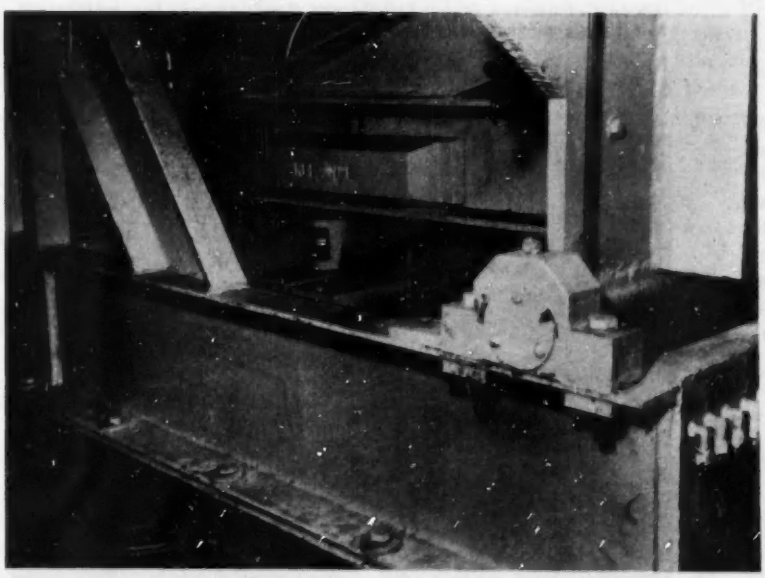
Now that its rocket engine program has been in operation for more than seven years, engineers of Bell Aircraft Corp., Buffalo, N. Y., have been able to develop instrumentation systems and test methods of measuring and recording engine and propellant performance with a high degree of accuracy.

The company has had the job of developing rocket engines for guided missiles and also studying various propellants for these engines. This requires many tests of performance as details of engine design are varied and different propellant combinations are tried under varying conditions of operation.

The hazards of testing require heavy reinforced concrete wall protection for operators and sturdy, accurate and reliable testing equipment with enough sensitivity to detect the variations of thrusts generated by rocket engines, and allow for accurate records at a remote recording station. Because of the nature of the tests, which run for periods of a few seconds to 10 minutes, only one test is normally run at a time. While tests are being run, other tests are being set up on other test cells so that runs can be made almost continuously throughout the day.

It was decided to use SR-4 load cells made by Baldwin-Lima-Hamilton Corp., for several reasons. Since they are small and contain the load-sensitive resistance wire elements in a sealed, strong cylindrical container there is little possibility of damaging them even if high transient thrusts or a minor explosion occurred during a test. They require no adjustment or maintenance. Their response to variations of thrust is extremely fast. Deflection under load is less than the deflection of the test stand. Load capacity of the units ranges up to 20,000 lb.

It was found possible to obtain strip chart recorders with faster than normal response so that accurate records could be obtained. These recorders were located in a centralized instrument room of a building at distances between 400 to 600 ft from the test cells.



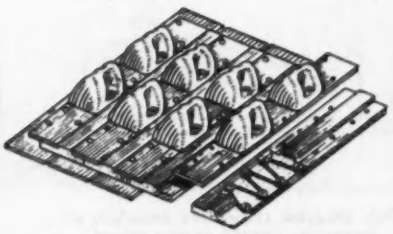
To measure and record electrically at a central instrument room the thrust produced by various rocket engines and fuels load cells of 20,000 lb capacity are used on a number of thrust stands. The horizontal arm of what is essentially a large, 90-deg bell crank rests on the load pick-up unit. The engine, not shown, is mounted on the vertical arm of the crank.

A rocket engine is mounted horizontally so as to extend outward from the upstanding end of a vertical arm of what is essentially a large, 90-deg reinforced bell crank. A Baldwin SR-4 load cell is mounted vertically on the base structure under the end of the horizontal arm of the "crank." The "crank" hinges on a pin which holds it on the base structure. Moment arms are of approximately equal length. Weights balance the overhanging engine. Engine exhaust is aimed out the open end of the test cell. The load cell is connected by electrical cable to a recorder in the central instrument room. Engine operating controls are behind a protective wall.

In order to be sure that the records obtained from the load cells that are incorporated in the test stands are true load reactions of the rocket engines, i.e.

(*Turn to page* 122, *please*)

British Crawler Tractor Has Special Rubber Tracks



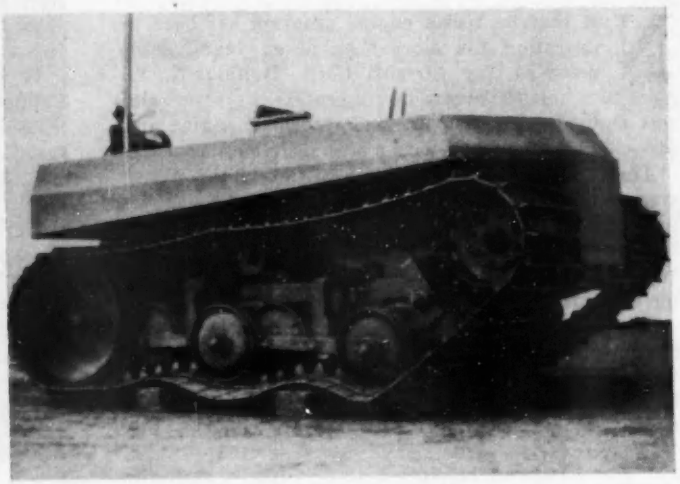
Details of the track construction. Rubber pads strengthened by steel cables, and sandwiched between shoe and dog plates, link adjacent sections.

FULLY flexible rubber tracks are the principal feature of the Water Buffalo crawler tractor built by Albion Motors, Ltd., Glasgow, Scotland. These patented tracks have rectangular rubber pads ½ in. thick sandwiched between the shoes and steel plates carrying driving dogs. Each pad overlaps a pair of shoes, forming a flexible link between them. Opposing bolt holes in the pads are connected and reinforced by endless steel cables molded into the rubber.

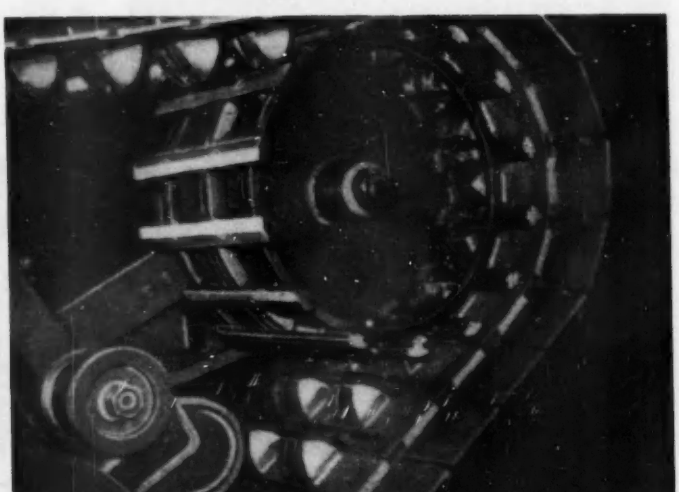
Full track flexing is permitted by two sets of triple-roller suspension units on each side. The forward drive sprocket maintains tension on the track top, leaving the bottom run free to follow irregular ground contours. The rear track roller is carried on an offset stub axle whose radial position is adjustable to facilitate track tensioning. The axle locating bolt is designed to shear when stones jam the track, thus slackening its tension.

These constructional features are claimed to give unusual ground adhesion and performance on gradients of up to one in one (45 deg), and in bogs and marshes. The steel hull of the crawler is fully watertight, and allows operation in depths of water to four ft. It is also said to provide complete buoyancy for the tractor in the event of breaking through a swamp crust. A front or rear mounted winch is available. When used with an anchor, this may be employed to assist the tractor to drag itself out of a bog. Under these conditions, track speed is synchronized with winch speed.

The Water Buffalo is powered by a four-cylinder Albion Diesel rated at 70 bhp at a governed 1800 rpm. The gearbox has five forward speeds and one reverse. With 36-in. wide tracks, the crawler weighs 17,530 lb and has a ground pressure of 2.26 psi. Drawbar pull in low gear is 19,000 lb.



Albion Cuthbertson Water Buffalo with flexible tracks and waterproof hull is designed for work on bogs, marshes, sand and other soft surfaces.

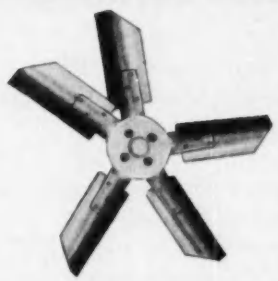


Front drive sprocket of the Albion Water Buffalo engages the steel dog plates of the flexible rubber track.

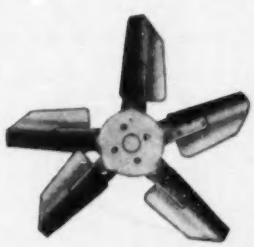
1918 TO 1954

from away back **THEN** *until* **NOW**

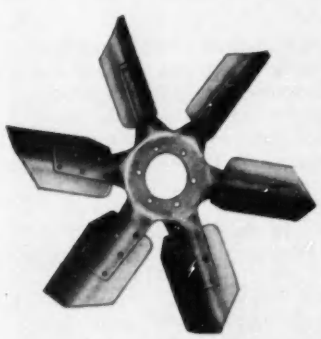
SCHWITZER-CUMMINS
Specialists in COOLING FANS



Heavy Duty Truck Fan



Extra Cooling
Passenger Car Fan



Heavy Duty Bus Fan

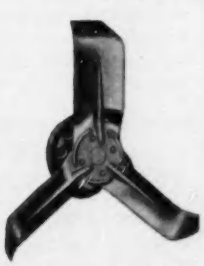
Shown Here are samples of many fine cooling fans with individual characteristics compounded for best performance of the engine and engineered, developed and manufactured in Schwitzer-Cummins plants and laboratories for blue-ribbon engines in the automotive world.

The founders of Schwitzer-Cummins Company were consultants on engine cooling in the pioneering days of the automobile. Then, with the formation of the company 35 years ago, became active as manufacturers of cooling fans and water pumps and qualified immediately as major suppliers to the then young automotive industry.

During this long stretch, a world of experience in fan design, application and manufacture has become centered in our fan division. Thousands of tough problems have been solved for our customers and much creative engineering has given the industry many "firsts" while manufacturing facilities have kept ahead of the times and remained unsurpassed for low production costs and precision work.

We are complete to develop and produce fans in an extensive variety of shapes, sizes, materials for virtually all purposes, automotive and stationary.

May we work with you on your next cooling fan requirement?



Passenger Car Fan

Light Truck Fan

Other Products

- EXHAUST DRIVEN TURBOCHARGERS
- SUPERCHARGERS (POSITIVE DISPLACEMENT)
- OIL PUMPS
- THERMOSTATICALLY CONTROLLED FAN DRIVES
- WATER PUMPS
- AIR STARTING MOTORS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING
- CRANKSHAFT VIBRATION DAMPERS

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Displaces metal by cold flowing

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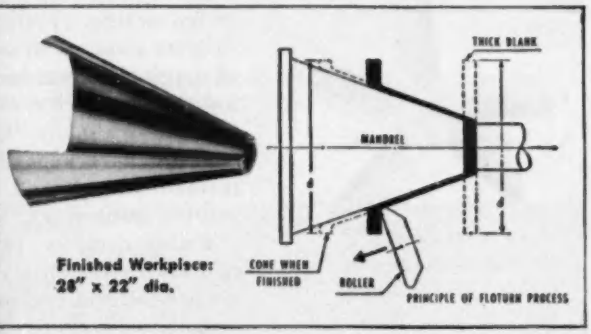
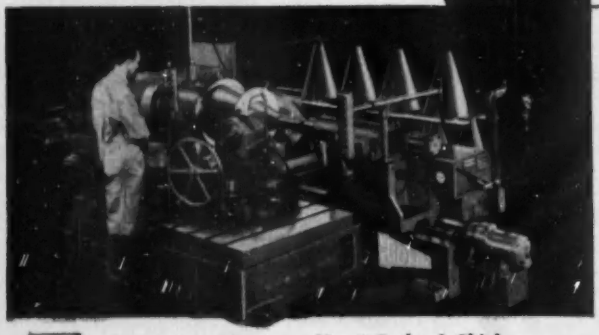
Write for complete details.





No. 40 Lodge & Shipley Floturn Lathe for cold forming.

HOW FLOTURN WORKS

. . . the FLOTURN process starts with either a simple flat blank, machined blank, machined forging, drawn cup, wrapped and welded cylinder or centrifugal casting. FLOTURN equipment scientifically applies great pressure against the blank, causes the metal to flow in a cold state. Pressure is spirally applied continuously, flowing the metal to the shape of a mandrel.

FLOTURN IS HIGHLY ACCURATE

. . . wall sections of work are uniform, predetermined, with never changing thickness and can be easily held to ± .002".

FLOTURN SAVES TIME, MATERIALS, TOOLING

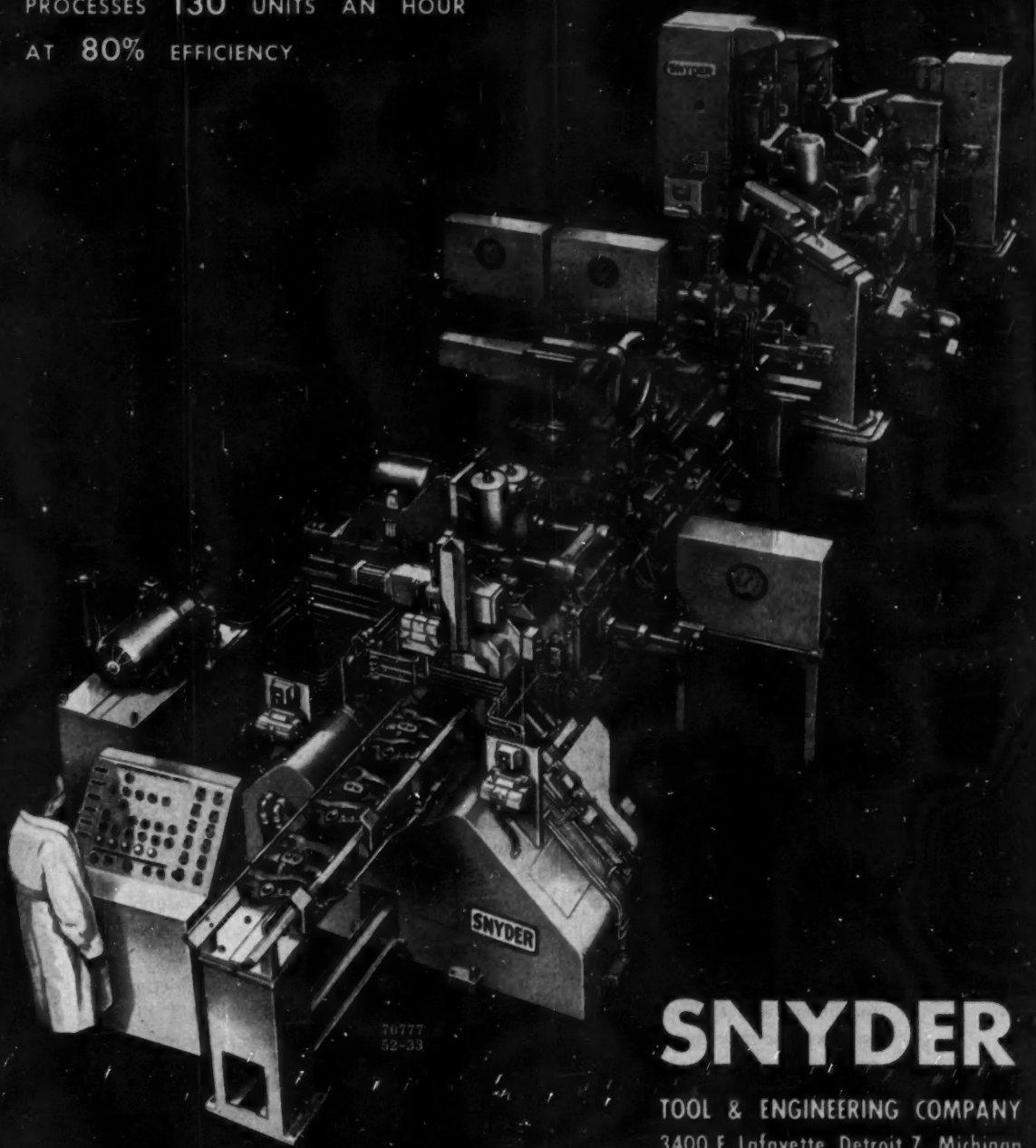
The FLOTURN blank weighs the same or slightly more than the finished part. FLOTURN tooling is low in cost—only about 1/10 the cost of deep draw dies, for example. Tooling life is long. FLOTURN forms a wide range of metals—from mild steel to the toughest alloys. FLOTURN adds strength and hardness.

L S FLOTURN

THE LODGE & SHIPLEY COMPANY
3055 Colerain Avenue, Cincinnati 25, Ohio

SNYDER SPECIAL 21-STATION AUTOMATIC LINE

TRANSFER MILLS, DRILLS, CORE-DRILLS, REAMS AND TAPS INTAKE MANIFOLDS; TESTS MANIFOLD FOR AIR LEAKAGE AND VOLUMETRIC AIR FLOW, INSPECTS PROCESSING PROGRESSIVELY, MARKS REJECTS; INSERTS HEATER TUBES; PROCESSES 130 UNITS AN HOUR AT 80% EFFICIENCY.



SNYDER

TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation with Leading American Industries

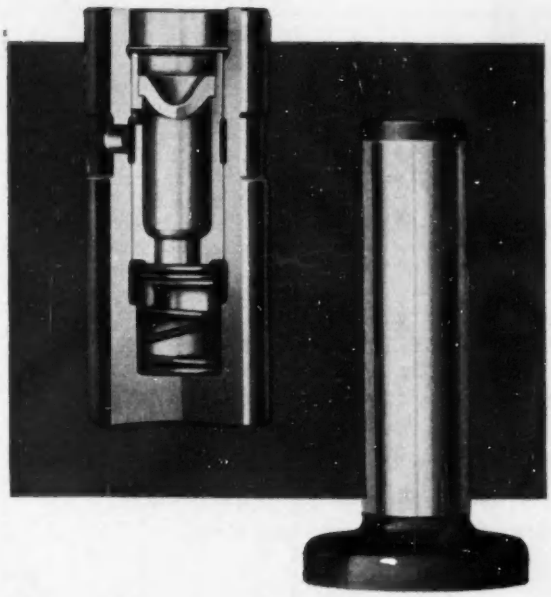
Eaton Tappets and Hydraulic Valve Lifters

are engineered to solve your tappet-face wear, scuff, and fatigue problems, with consideration of—

1 Stresses involved

2 Metallurgical compatibility

3 Wide range of lubricating oils



Eaton provides tappets and hydraulic valve lifters with faces of the following materials, produced under metallurgical control of the highest order:

- Steel
- Hardened Alloy Cast Iron
- High-strength Chilled Cast Iron

Eaton engineers may have the solution to your cam and tappet wear problems. Inquiries from manufacturers are invited.

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9771 FRENCH ROAD • DETROIT 13, MICHIGAN
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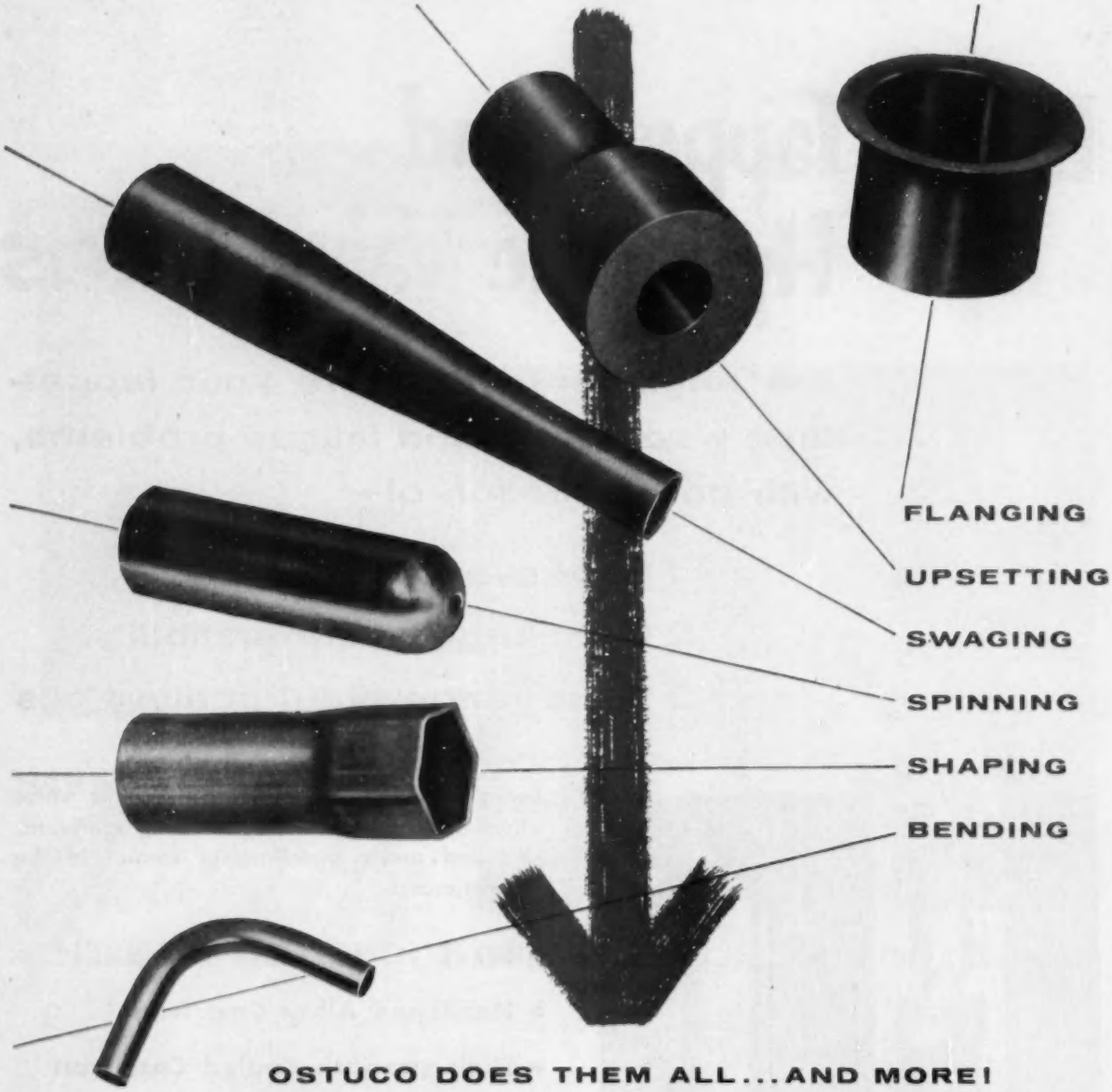
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers



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117 Liberty Street, New York 6, New York

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Automaticity and Automation Will Be Chief Topic at American Institute of Electrical Engineers Conference on Machine Tools

Machine Tool Orders Experiencing Pickup

Most of the machine tool builders are not disconcerted over the drop in orders during July, and they anticipate that 1954 will be a good year regardless. Orders, which increased during June for the first time, declined to $36.5 million in July but showed a noticeable pickup in recent weeks following the vacation period let-down. The backlog at the end of July dipped to a new low equal to 3.4 months' output against 7.4 months at the same time last year.

Machine Tool Conference Features Automation

Major theme of the American Institute of Electrical Engineers conference on machine tools to be held in Detroit, October 25 to 27, will dwell around automaticity and automation. P. H. Alspach, General Electric Co.; M. M. Arlin, of Arlin Products; Norman K. Conrad, Ford Motor Co.; and Ralph E. Cross, The Cross Co., will present papers dealing with automation present and future. The unique record play back control used on a Giddings and Lewis skin mill will be discussed by H. E. Ankeney, Giddings and Lewis Machine Tool Co.; and John L. Dutcher, General Electric Co. They will describe completely the operation of the tape controlled skin milling machine, including how skins are made, how a record playback works, and how tape is prepared. Two engineers, A. V. Wise and J. W. Picking, from Reliance Electric and Engineering Co. will talk about the increasing reliability of industrial electronic controls. The primary objective will be the discussion of a package type industrial electronic control unit. A panel discussion concerning the use of electric clutches on machine tools will be held. Members of this panel will include H. B. Stalling, I. T. E. Circuit Breaker Co.; John B. Brown, Jr., Warner Brake and Clutch Co.; and W. G. Martin, Vickers Electric Division.

Electro-Discharge Machine Cuts Holes in Jet Parts

Recently, The Cincinnati Milling Machine Co. built a four-station electro-discharge machine which cuts 32 elliptical holes in stainless steel jet engine diffuser cases in a floor-to-floor time of 110 min. The method of machining is shown in the four illustrations below.

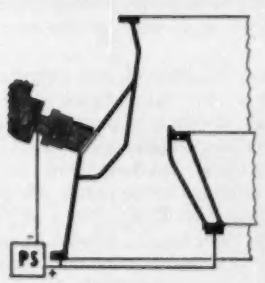
The machine utilizes an Elox power pack for supplying the low voltage, low amperage current necessary for this operation. Four machining operations are required to produce each of eight sets of the radially spaced elliptical holes. The contour of the holes must be held to plus or minus 0.005 in. and each group of four holes must be in line within 0.001 in.

Tooling consists of four servo-controlled slides each of which carries a tubular brass electrode. The slides are mounted on air-actuated rams for rapid advance and retraction. Each electrode is designed to the contour of the ellipse and shaped so that the cutting surface conforms to the profile of the wall to be machined. When the electrodes are advanced to cutting position, they are covered by a dielectric fluid. Servo feed is controlled by the voltage across the gap between the tooling and the workpiece. When the electrode passes through the opposite wall of the work, it continues to feed, sizing the hole until stopped by a limit switch.

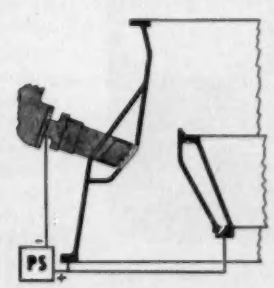
Market Research, Subject Of Gray Iron Meeting

The Gray Iron Founders Society, Inc., will hold its 26th Annual Meeting at Hot Springs, Va., on November 11 and 12. Two panels will discuss market research and insurance. One of the major speakers at the meeting who will analyze business conditions will be Martin R. Gainsbrugh, chief

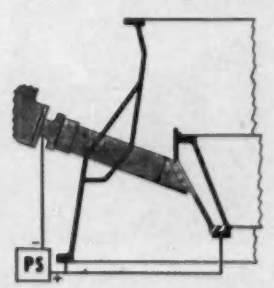
OPERATION OF THE CINCINNATI ELECTRO-DISCHARGE MACHINE



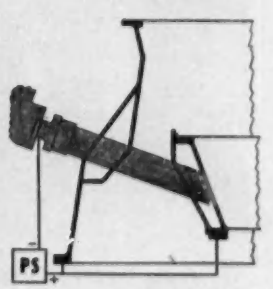
First station — electrode cuts hole through outer wall of larger shell. Workpiece then indexes to next station.



Second station — Electrode passes through first hole, and then cuts hole through inner wall of larger shell.



Third station—Electrode passes through walls, cut at stations 1 and 2, and cuts hole through outer wall of smaller shell.



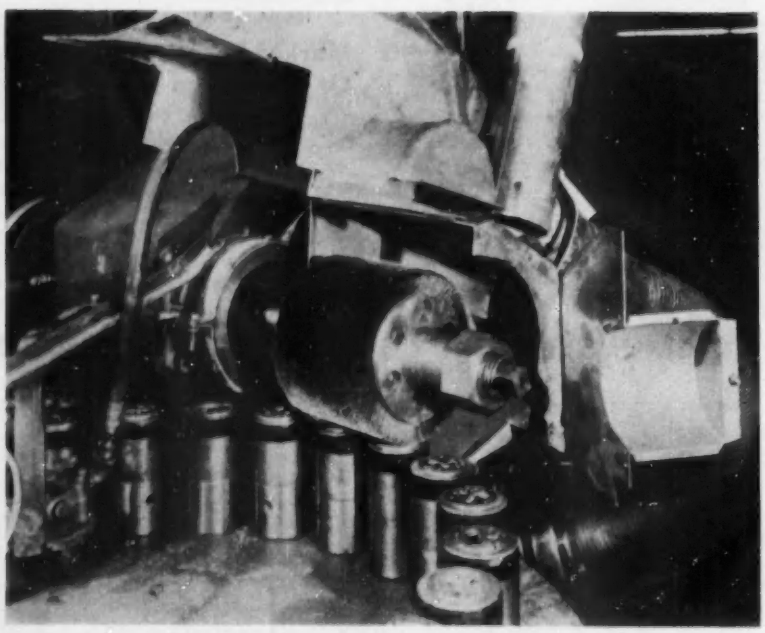
Fourth station — electrode passes through three previously machined holes to cut inner wall of small shell.

The Heald Machine Co. has recently produced this completely automated Model 335 Bore-Matic transfer type machine for one of the large automotive manufacturers. This unit will finish bore, ream, drill, and assemble valve guides in a new V-8 cylinder head.

economist, National Industrial Conference Board.

Die Castings to Cost Less

Rubber dies developed in conjunction with a centrifugal casting process are said to materially reduce the cost of tin base die castings. According to the Tin Research Institute, the alloys for this process found most suitable are essentially tin with additions of antimony and copper. The process provides a convenient method for the production of small die castings of intricate design, and where the sharpness and detail of the castings are important but exact dimensional accuracy is not necessary.



The power brushing technique displayed in this illustration finishes 15,000 fuse components in seven hours. Power brushes made by The Osborn Manufacturing Co., Cleveland, remove feather burrs and blending surface junctures after the fuse disks are machined. A Parker automatic machine equipped with 24 rotating spindles is utilized. An air jet is used to lift the finished part from the machine fixture and deposit it into a chute. The brushes run for 16 hrs per day, 5½ days per week and have a service life of approximately nine months.

Die Casting Award

Highest prize of the die casting industry, the Doehler Award, was presented to Walter M. Goldhamer, vice president, Superior Die Casting Co., Cleveland, during the American Die Casting Institute's 26th Annual Meeting held in Chicago last month. Mr. Goldhamer received the award for conceiving and organizing the Die Casting Research Foundation for metallurgical investigation on metals and processes.

Around the Industry

Chambersburg Engineering Co., Chambersburg, Pa., has recently completed a new three-floor 15,000 sq ft office building. Officials at Chambersburg state that business is picking up and the future looks very bright for the company.

Rochester Manufacturing Co., Rochester, N. Y., has appointed Allen H. Ottman executive vice president and general manager, according to William Mulcahy, president. Mr. Ottman also will serve as a director of the company.

The Cross Co., Detroit, has recently purchased a new twin engine Aero-Commander airplane with a seating capacity for six persons and pilot.

Sheffield Corp., Dayton, Ohio, displayed its products at the fourth European Machine Tool Exposition held at Milan, Italy, last month. Sheffield had on display its Cavitron ultrasonic machine tool for the first time on the continent.

Taft-Peirce Manufacturing Co., Woonsocket, R. I., has announced that

(*Turn to page* 128, *please*)

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

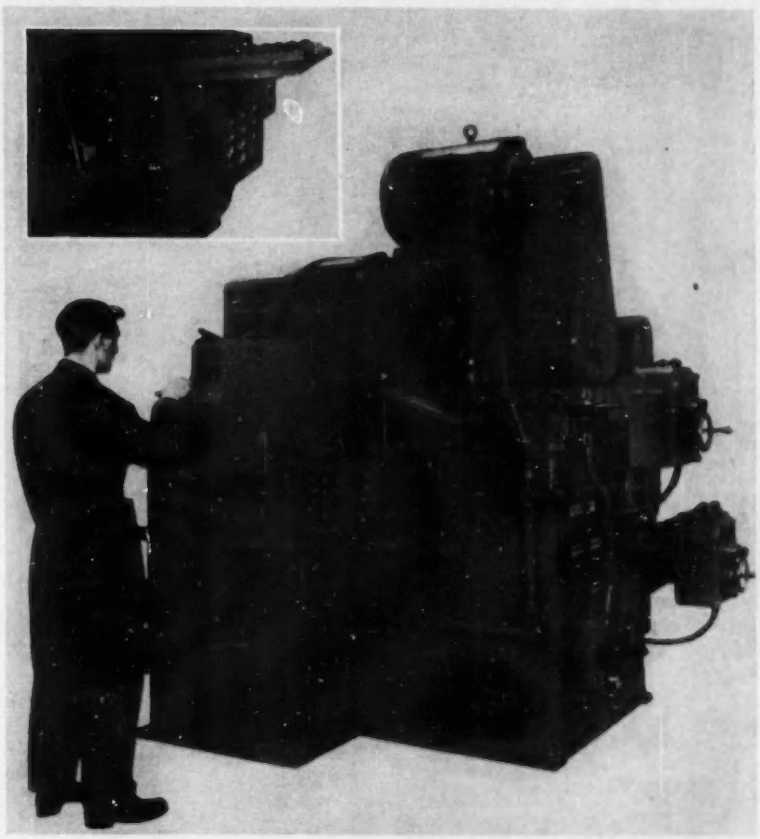
Horizontal Spindle Two-Head Grinder

A SPECIAL two-head grinder for grinding the closed end of automotive valve tappets, features the grinding heads operating on ball bearing ways. A double roller type bearing takes the radial load, and two ball thrust bearings carry the thrust load. Each head pivots to adjust angularity.

Each grinding head slide is provided with automatic feed, but can also be operated manually. A caliper on each head registers from the ground surface when insufficient stock is being removed, moving in the head a predetermined amount. Counterweights hold each head in against an adjustable stop. A power-operated swinging dresser is provided for each head, employing ball bearing cutters. Dressers are enclosed within the head.

A rotary work carrier of the V notched type is operated through a Vari-speed drive unit permitting speeds within a 3 to 1 ratio. A chain hold-down attachment keeps the tappets in the carrier V's during grinding. An inclined trough into which the tappets are stacked, permits the work carrier to pick up these parts one at a time as it revolves. They are unloaded by gravity. Production is 2400 tappets per hour, based upon 0.028 to 0.038 in. maximum stock removal. Tolerance is within 0.002 in. for uniformity. *Gardner Machine Co.*

Circle 56 on postcard for more data

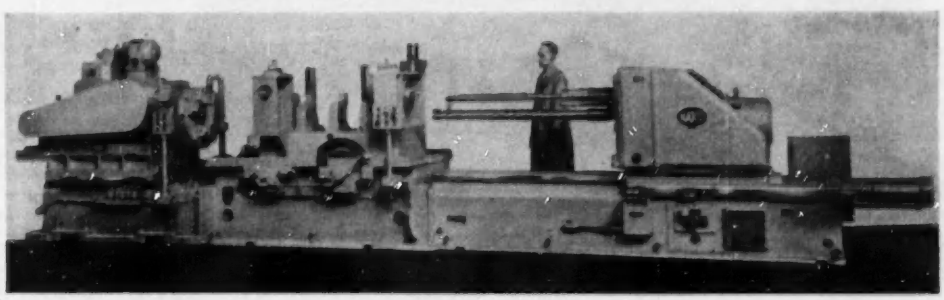


The Gardner No. 723, 23-in. two-head grinder with close-up of the rotary work carrier.

Bore and Face Together on Diesel Block

This Boreface machine features simultaneous cam and crank finish boring, and flywheel case facing operations. Two heads speed production of Diesel engine blocks. At 85 per cent efficiency, it completes 4.3 parts per hour. (National Automatic Tool Co.)

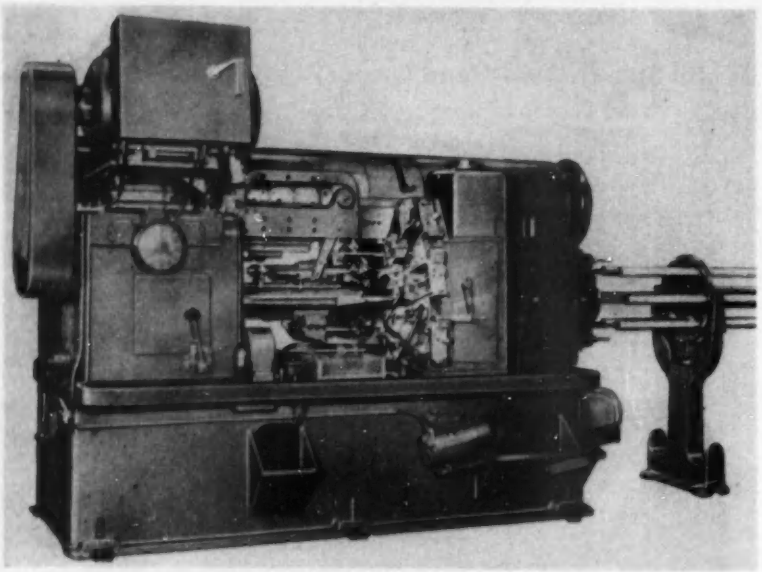
Circle 57 on postcard for more data



NEW EQUIPMENT — PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

Quick-Change Six Spindle Bar Machine



The Conomatic model TF, 1⅝-in. six spindle bar automatic is said to be suited to relatively short and medium runs as well as long runs.

THE 1⅝-in. model TF is the eleventh member of a group of currently available six spindle bar machines, and the sixth fast setup and quick job-change model.

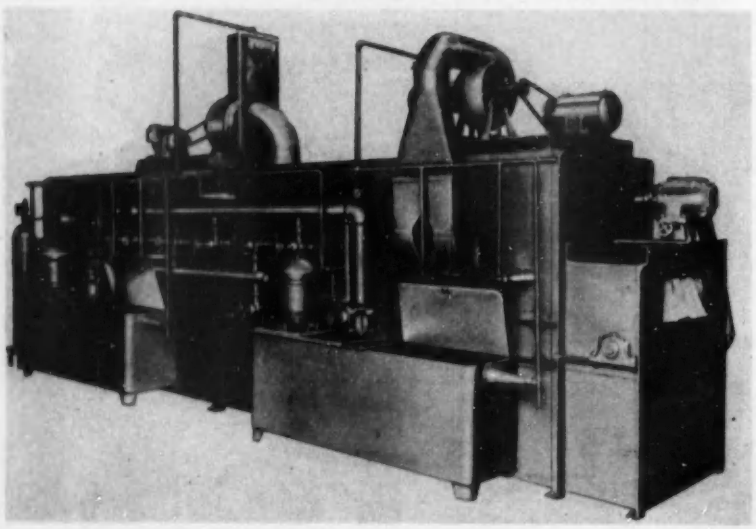
Some of the more important features are: A stronger machine frame with more powerful motor drive; larger diameter transmission shafts and bearings; large diameter work spindle carrier, with wider spindle spacing for cooler spindle bearings; larger diameter main end slide, with 3¼-in. work center clearance; and heavier stronger main end slide drive arm.

Cycle times include a 2.5-second minimum work cycle, a five-minute maximum work cycle, and a 1.7-second idle time. Fast and slow spindle speed ranges are provided; pairs of pick-off change gears provide 31 speeds from 128 rpm through 2502 rpm. Calibrated dial adjustment of the working strokes of the six independently actuated main cross slides, main end slide, and opposed tool spindles is provided without change of total stroke or interference with positive stop settings, and with minimum change of master cams.

There are two auxiliary cross slides, and an open-end attachment spindle drive with independent speeds to opposed tool spindles mounted in any, or all, tool positions of the main end slide. This provides independent feeds for the opposed spindles in three positions of a single setup. *Cone Automatic Machine Co.*

Circle 58 on postcard for more data

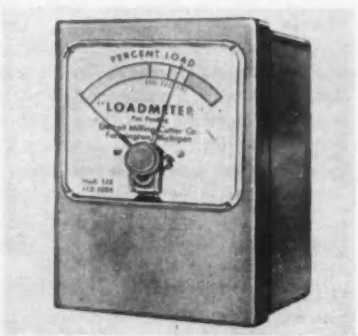
Petroleum Solvent Cleaning Machine for Bearings



This cleaning machine using low-flash petroleum type cleaning solvents has been designed to remove grinding residue and shop dirt from precision ball bearing parts before assembly. The parts, carried in baskets on a powered conveyor, pass through a three-phase cleaning process; two high pressure fan-shaped curtains for washing, and a blow-off to remove excess solvent. (The Alvey-Ferguson Co.)

Circle 59 on postcard for more data

Overload Meter



New features of model L-122 Loadmeter now available for detecting motor overloads include: Calibration can be performed by the user; the donut type transformer provides ease of installation by running a motor lead through the transformer hole at the switch box; and the box of welded 16-gage steel meets all J.I.C. and N.E.M.A. standards. (Detroit Milling Cutter Co.)

Circle 60 on postcard for more data

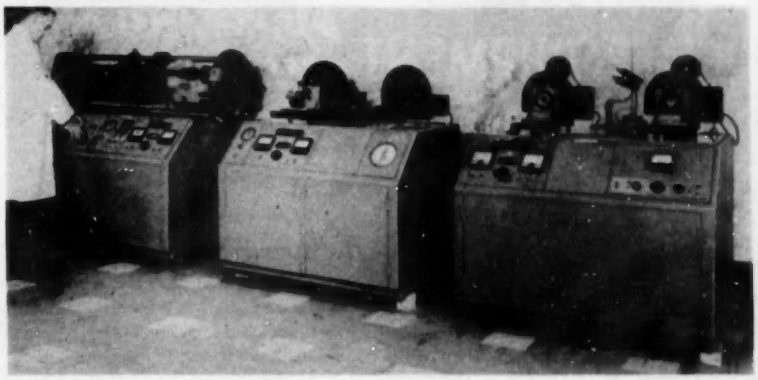
Universal Electro-Mechanical Equipment Test Units

THREE test stands capable of testing the performance of a broad range of electro-mechanical equipment under rated loads have been developed. Universality is achieved by means of special test leads which are said to fit any unit, regardless of the type of connection, with the minimum of adaptation.

The linear actuator and screwjack test stand, designated LT-1043, has a cam-setting device and a removable drive dynamometer. The loading device, a horizontally-mounted, double-action hydraulic cylinder, can accommodate very large units. Suitable coupling adapters are supplied.

The rotary actuator and power unit test stand, model LT-1044, provides an electronic timer and revolution counter. Dynamometers covering desired testing ranges are supplied. A cam-setting index is part of each dynamometer.

The motor test stand, designated LT-1045, incorporates a photoelectric tachometer which is used in conjunction with two homo-polar, absorption type dynamometers covering six force ranges. Standard for d-c motor testing, it can be adapted for a-c motors. Coupling adapters for all types of fractional-horsepower motors are supplied. A d-c motor panel, covering ranges from one through 50 amp, with suitable circuit breakers, is part of each test stand. Operating limits can be set for all performance tests. The test stands are available either as a package or separately. *Lear, Inc.*



The three Lear performance test stands for aircraft accessory or other equipment testing.

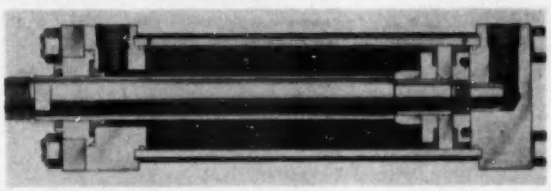
Circle 61 on postcard for more data

General Purpose 2000-PSI Hydraulic Cylinders

HYDRAULIC cylinders now available for machine tool, metalworking and general purpose industrial applications are manufactured by Waterbury Tool Div. to comply with JIC standards. The units are said to occupy minimum space due to use of square rod end and head end caps that house the pipe connections. The cylinders are rated for a maximum working pressure of 2000 psi.

So-called Compact cylinders can be furnished with adjustable hydraulic cushions on either or both ends to decelerate piston rod movement. Each port can be independently rotated to any 90-degree position in relation to the mounting. The honed cylinder barrel can be rotated so that the ball-and-set-screw air vents (provided when specified) are at the top regardless of mounting position. Mountings available include foot (bracket), flange (head end), flange (rod end), extended tie rod, and clevis.

The series is available in standard sizes from 1-½ in. to six in. bore. Cylinders may be obtained with standard or heavy duty piston rods. The heavy duty rods are available for applications involving differential operation with approximately equal speeds in both directions, where extra stiffness or a faster return stroke is required, or where it is desired to use a shoulder to lock against at the end of the rod.



Vickers Compact hydraulic cylinder for machine tool, metalworking and general purpose industrial applications.

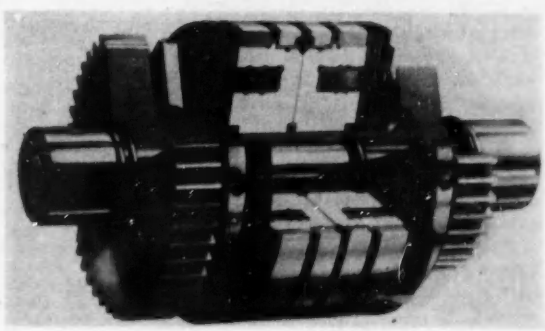
A confined O-ring gasket type of construction is utilized in assembling the barrel, end caps and piston rod bushing. Impregnated leather piston cup seals are used at all temperatures up to 165 F. A preloaded, sealed rod packing is used at the rod end. Both standard and heavy-duty piston rods are made from high strength alloy steel that is ground, polished and hard-chrome finished. High grade alloy iron is used for the pistons, while follower rings and nuts are made from cold-rolled steel. Heavy wall seamless steel tubing is used for the cylinder barrel, with cylinder walls honed. *Vickers, Inc.*

Circle 62 on postcard for more data

Magnetic Clutch for Tools or Vehicles

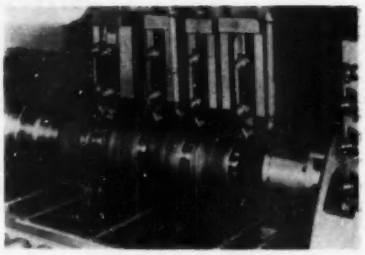
The Electro Clutch is designed for transmissions employing constant mesh gearing, for machine tools or automatic transmissions. It is controlled by a 24-volt dc circuit and no field adjustment of the torque value of the clutch can be made. (I-T-E Circuit Breaker Co.)

Circle 63 on postcard for more data



NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89



Close-up of multiple carbide tool contour turning of a part in a Model HD-16 lathe, control panel at right and chip chute.

Rotation Reversed on Automatic Lathe Line

HIGH-PRODUCTION lathes for boring, facing, and turning of straight, tapered or contoured work with carbide tools recently entered the market.

Direction of rotation is reversed from normal practice. Tooling is in the back of the machines, resulting in an unobstructed loading area. With tool pressures or rear tools being downward, combined cutting speeds and feeds giving metal removal rates as high as 52 lb per minute have been used successfully.

On the eight-in. Model HD-8 lathe, a motor of 30 hp at 1800 rpm is recommended for the spindle and main drive. The 16-in. Model HD-16 lathe calls for a 100 hp motor. Proportionate motor sizes are provided for on the 12 and 24-in. lathes.

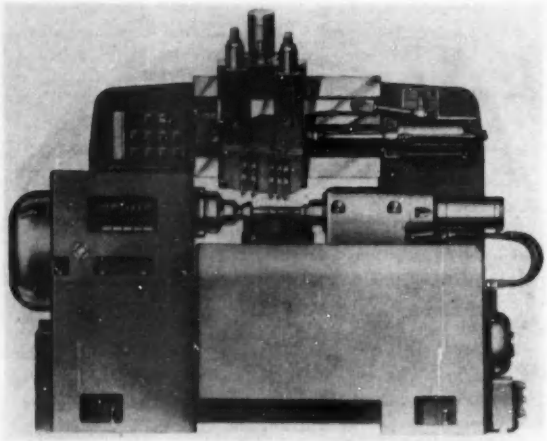
Spindle speeds are infinitely variable and range from 82 to 2400 rpm on the eight-in., from 98 to 1475 on the 12-in. and from 66 to 1072 rpm on the larger models.

Design conforms to both hydraulic and electrical JIC standards.

Hydraulically operated carriages and slides may be set to perform automatically practically any combination or sequences of operations. Each carriage or slide may be operated independently through selector switches and push buttons on the single central control panel.

Automatic multiple cycling is provided for on these machines when desired, permitting consecutive roughing and finishing of parts in the same setup and the same tooling without stopping the machine. Either cam control of carriages and slides or tracer operation are available. Rear as well as top carriages can be adapted for longitudinal feeds. All models can be supplied either with the hydraulically operated tailstock or with standard or special platen slides. *Hydra-Feed Machine Tool Corp.*

Circle 64 on postcard for more data



General view of the new Model HD-8 Hydra-Feed Lathe.

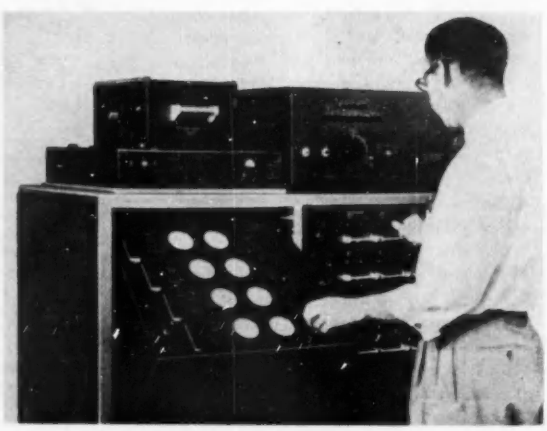
Sixteen-Channel Recorder

THE model CR-I recording oscillograph provides continuous, time-synchronized records of up to 16 phenomena at frequencies as great as 50,000 cps. All channels are recorded simultaneously on 8-in. wide photographic paper at chart speeds of three to 40 in. per sec. By means of the integral single-sweep circuits, the instrument's eight dual-gun cathode-ray tubes may also be directly photographed at frequencies as high as 250,000 cps.

The CR-I contains its own power supplies, preamplifiers and deflection amplifiers, and recorder in a single cabinet.

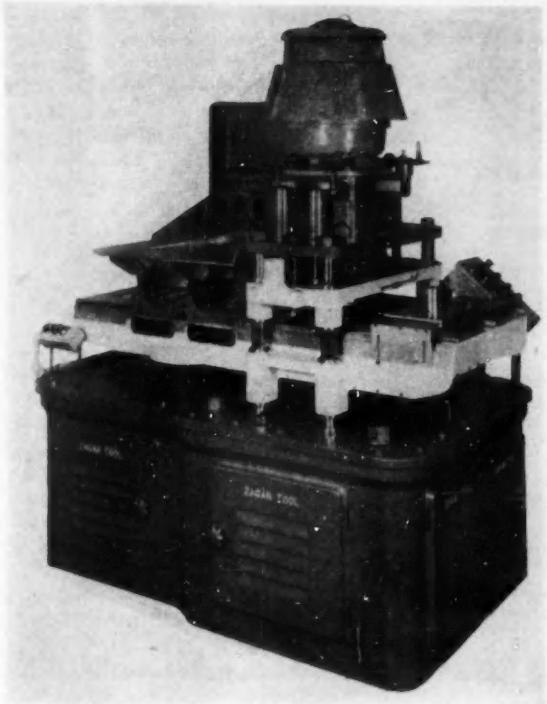
Optically flat three-in. cathode-ray tubes, a patented optical system, and high record speeds combine to produce continuous oscillograms up to 300 ft long. Timing lines of 1/10, 1/100 and 1/1000 sec establish a common time base. *Wm. Miller Instruments, Inc.*

Circle 65 on postcard for more data



The Miller CR-I 16-channel oscillograph has individual controls on all channels.

Mechanical Drilling Machine Has 529 Spindles



The Zagar 529-spindle drill head with mechanical drive.

IN a high speed drilling machine which recently became available, all movements are mechanical. Diameter of the holes drilled is 3/16 in. The drill head is of the gearless design thus permitting centers of ¼ in.

Material to be drilled is loaded manually into a hopper. It is mechanically positioned under the drill head for the drilling cycle. Removal of the drilled part can be done by the next piece as it is fed mechanically to drilling position.

The 529-spindle drill head is directly driven with a 30-hp motor. The ram is actuated by a mechanical motion similar to that of a shaper and is located in the base of the machine. Length of stroke, depth of drill and rate of speed can be adjusted to hole-finish requirements. *Zagar Tool, Inc.*

Circle 66 on postcard for more data

Quick-Seal Hose Couplings

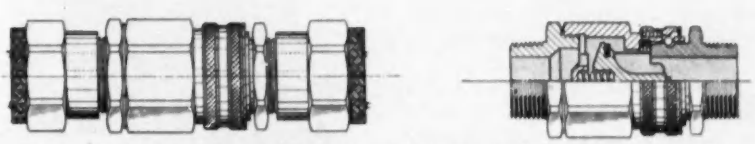
A QUICK-SEAL, leak-proof hose coupling with built-in single or double check valves is in production. It is said to be suited for high-pressure, heavy-flow applications because of a simple construction which makes the hose line leak-proof the moment the coupling is closed, and seals it tighter the higher the pressure builds up inside. In addition, this construction provides a full-swiveling feature.

Either a single or double check valve shuts closed either one end or both ends of the fluid line the instant the coupling is opened.

The couplings are made in several types for different methods of hose attachment—the female pipe thread, male pipe thread, expansion ring, or barb shank type. All are interchangeable in the same size. Standard materials are cadmium plated steel with neoprene and Buna-N seals.

All bearing surfaces in the coupling are heat-treated and ball bearings and springs are made of stainless steel. The range includes eight standard sizes from ¼ in. to two in. in stock. *Titeflex, Inc.*

Circle 67 on postcard for more data

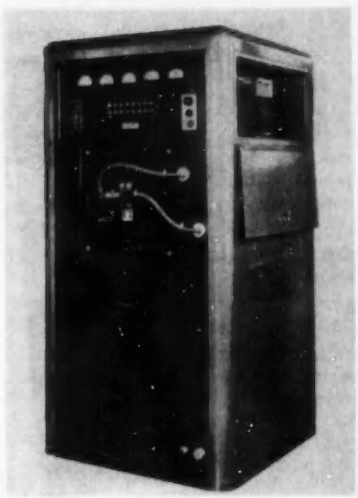


In the final step in connecting Titeflex quick-seal check-valve coupling, release of collar on coupling body pushes the retainer balls into groove, locks both ends of coupling together. Nipple keeps check valve open. Fluid pressure forces lip of seal ring apart. Retainer balls in nipple groove keep both ends of coupling locked together but permit hose to swivel freely.

Control for Heating

A MOTOR generator control and heating station has been designed for forging, hardening, brazing or annealing operations where deep penetration of heating is desired. Motor generator sets with frequency cycles of 960, 3000 or 9600 and power inputs ranging from 50 kw to 1250 kw for use with the new station are available.

The station has been designed to enable metering to be located on either the front, right or left side. The output transformer can be installed or removed through either the front or rear of the station. The output transformer busses can be either vertically or horizontally oriented to accomodate different types of work coils.



Motor generator control and heating station for deep penetrating.

Operations may be timed automatically by means of a four-circuit synchronous timer capable of controlling three operations in addition to the heat cycle. Vernier adjustments are furnished on the first three positions for accurate heat, quench and capacitor contactor. *Lindberg Engineering Co.*

Circle 68 on postcard for more data

NEW EQUIPMENT — PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

Extra Heavy Duty Surface Grinders

TYPE CX hydraulic surface grinders now being offered for heavy duty production feature heavy base and single column design. They are said to provide rapid removal of stock while maintaining close limits and fine finish.

Among the announced features are: Cross feeding wheelhead with horizontal spindle grinding with the periphery of a 20-in. diameter wheel; simplified centralized control; flame hardened cross slide ways; rigid work table; "in position" wheel truing and direct-coupled motor drive to wheel spindle. A low pressure hydraulic system is used, and the ways, slides and spindle bearings are automatically lubricated. A range of sizes from 30 by 26 by 72 in. is available.

Table speeds are 10 to 100 fpm with vertical feed hand wheel graduated to 0.0005 in. and powered at 15 ipm. The cross feed hand wheel is graduated to 0.001 in. with power 1/32 to three in. Hydraulic wheel truing is six ipm. and hydraulic rapid traverse at 240 ipm. Grinding wheel speed is 6000 fpm. *Thompson Grinder Co.*

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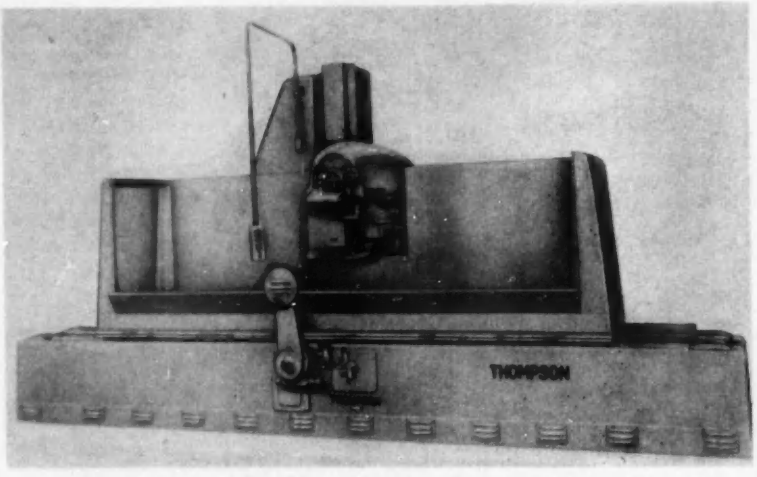
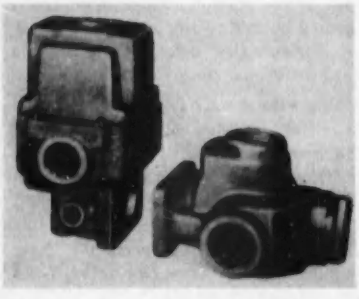


This Thompson CX, 36 by 48 by 120-in. machine is equipped with auxiliary raised elevation attachment and swinging pushbutton station.

Air Control Valve

A LINE of in-line type air-control valves is announced, to comply with all JIC design standards. The



The in-line type air control valve.

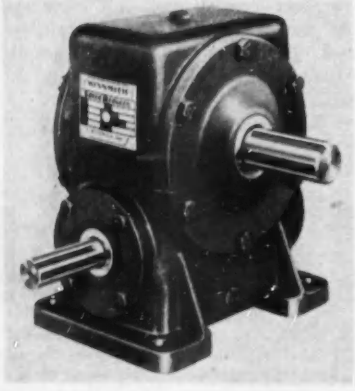
valves provide a fully enclosed solenoid, and are claimed to function efficiently down to five psi. Exhaust can be throttled for speed control.

The entire line consists of 47 models with pipe sizes ranging from ¼ to one in. comprising two-way and three-way actions, solenoid and remote pilot actuation, line-mounted and foot-mounted. The solenoid pilot head and the remote pilot head are interchangeable on the main valve assembly. *Numatics Operating Valve.*

Circle 70 on postcard for more data

Speed Reducers

DEVELOPED to provide greater capacity within more compact dimensions, the C line of worm gear speed reducers consists of three new designs, CB, CT and CV, in 13 sizes each. The first five sizes, within the 1/100 to five hp range, in ratios of 5:1 to 60:1, are now available. The balance of sizes, already designed, will be in production soon.



The Winsmith speed reducer.

Fulfilling all American Gear Manufacturing Association standards, the new speed reducers are equipped with gears, bearings and shafts rated for AGMA Class 1 Service. Housings are of one-piece construction and rigidly reinforced. Surface area is said to provide ample heat radiating capacity. *Winsmith, Inc.*

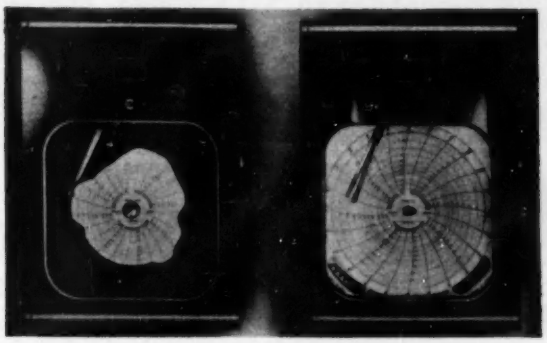
Circle 71 on postcard for more data

Sheet Lifter

As long as the trigger in the pistol grip type handle of the Pres-Vac sheet material lifter is held down, the suction cup will pull 11 psi. This constant, positive lifting power is produced by passing compressed air through a venturi at 45 psi, creating a constant vacuum of 22 in. of mercury. The vacuum is conveyed to a rubber cup through passages in the handle. *F. J. Littell Machine Co. Air Div.*

Circle 72 on postcard for more data

Instruments to Control Test Cabinets



The Bristol cam-operated program controller for test chambers.

CONTROL instruments now available for use with environmental test cabinets can be used to initiate and maintain an entire program of varying climatic conditions within the test cabinet, and to simulate any desired temperature, humidity, or altitude.

The program controllers, available in one or two case models depending on application, are built to carry through the program repeatedly and reproduceably. They can also be used to bring temperature, pressure, or vacuum up to any desired value and maintain it there for a predetermined length of time. Accuracy of control is ½ per cent of full scale value. The instruments are available with electric on-off or proportional-input control, or with pneumatic control in proportional, reset, or derivative modes.

A plastic or aluminum cam serves as the template for the program. The cam can be changed in a matter of seconds for another cut to a different program. *The Bristol Co.*

Circle 73 on postcard for more data

Light Caulking Gun

A LIGHT-WEIGHT sealant gun has been developed and placed in use by Douglas Aircraft Co.

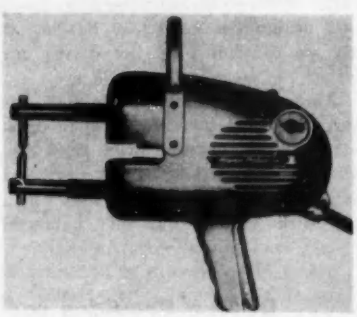
Empty weight of the gun is less than 17 oz, yet it is claimed to hold 30 per cent more sealing compound than conventional equipment of more than twice that weight. In operation, the sealant is extruded smoothly by means of a simple valve which has been tested through a million operating cycles at 100 psi. Upon release of the trigger, flow ceases immediately. For close work, the gun may be triggered from any position or operated without the detachable handle. A shorty model also is available. The air-hose passing through the gun handle swivels 360 deg.

The Douglas-Semco lightweight caulking gun gets into confined places.

Disposable cartridges, plungers, and nozzles are molded from polyethylene. Nozzles are available in a wide variety of sizes and shapes. The threaded end is fluted for easy removal and the discharge end is tapered so that flow can be increased by slicing off the end to enlarge the aperture. *Semo Research Inc.*

Circle 74 on postcard for more data

Portable Welder



Ampower 10 kva welder.

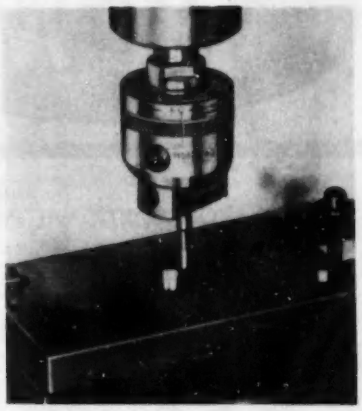
A PORTABLE spot welder now available features electronic timing control enclosed within the unit itself. It offers timing cycle from 1/60 to one second. It is said to weld most alloys of aluminum sheets, steel, mild and stainless, also galvanized and cadmium plated. Output is over 10 kva. Weight is 26 lb.

Also available is a stand for semi-production work. *Ampower Products Co.*

Circle 77 on postcard for more data

Offset Boring Head

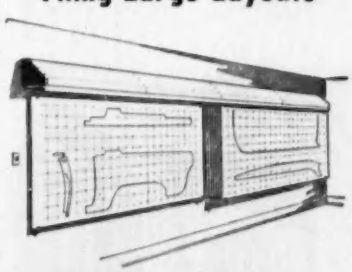
THE Deka-Bore boring head for both production runs and single piece work has two independent means of adjustment. The offset dove-tailed tool holder slide is activated by the conventional micrometer screw for roughing-in the hole. A pre-determined pressure factor bearing on the gibs is said to eliminate back lash. The calibrations on the body are the means for independent, direct, and positive adjustments of 0.0001 in. on the diameter or 0.00005 on a radius. *Precision Tool & Mfg. Co. of Illinois.*



The Deka-Bore offset boring head.

Circle 75 on postcard for more data

Filing Large Layouts



A device to file large layouts. Roll-A-Way filing systems consists of a rack with any specified number of parallel tracks from which the layouts are suspended by means of roll hangers. Tracks are spaced one in. or more apart. The rack may be any length required, either attached to the wall or mounted on caster-equipped standards. It is fluorescent lighted. (Inter-Lakes Engineering Co.)

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NEW PRODUCTS

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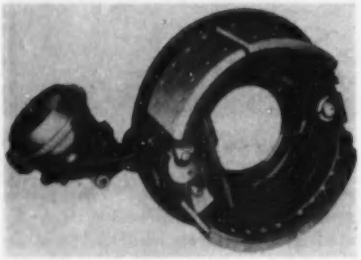

Brake Anchor Pin Requires No Lubrication

A self-contained air brake is now available on a number of the maker's axle models. One feature is the comparatively short chamber bracket mounted directly on the brake spider, which allows the use of a short rigid camshaft. Hardened semi-cylindrical brake shoe ends are used, both upper and lower shoes engaging a single anchor pin. At the cam end of each shoe, a trunnion-type roller and pin are used in a half-round yoke, with the roller free to rotate on the pin and the pin free to rotate in the shoe. These and the anchor pin are said to require no lubrication. *Eaton Mfg. Co.*

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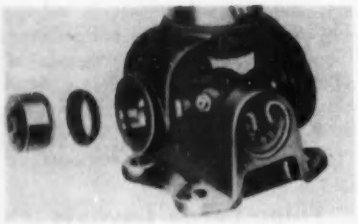

Synthetic Joint Seal Available Commercially

A synthetic rubber lip-type seal, which has been in military use for over three years, is now being marketed. It is said to maintain seal contact under all universal joint operating conditions, especially where dirt and moisture are problems. Retained in the new seal is the feature of the cork seal in relieving lubrication gun pressure without seal damage and permitting bearing flushing during relubrication. It is available as an integral part of all Spicer universal joints for original equipment. *The Dana Corp.*

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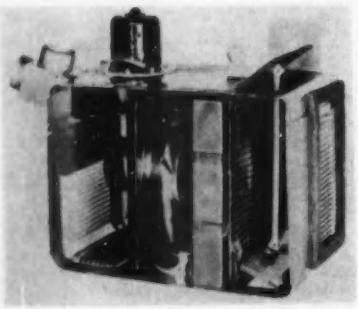


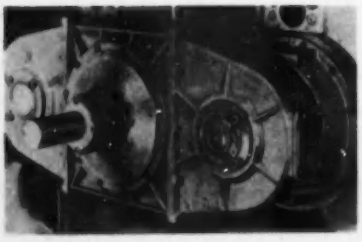
Heater-Defroster for Large Truck Cabs

A heater-defroster designed for large truck cabs has been introduced and designated as Model ED-90. It can be controlled by the driver for either recirculating or fresh air.

Among the features claimed for this unit are a powerful built-in pressure type defroster blower (72.2 cfm of hot air at windshield); controlled summer comfort, 100 per cent fresh air with water shut off; balanced heat distribution to cab floor for driver and other riders, and pressurized heating and ventilating when set for all fresh air.

Among the standard features said to be found on the ED-90 are engineered-to-match motors, fans and cores; easily accessible components; and a one-year (or 50,000 mile) warranty. *Evans Products Co.*

Circle 38 on postcard for more data



Device Provides for Multiple Engine Output

Standard flanges and two interchangeable basic units that may be arranged in a large number of combinations are features claimed for so-called Combo-Power Units now available. Two, three or four small engines may be compounded to provide the required power and torque. The illustration shows a two-engine hook-up. Standard flanges are said to provide for easy adaption of clutches, torque converters, right angle drives, gear reductions or other auxiliary drives at each crankshaft centerline. Other combinations of the basic units include power dividers and side load power take-offs. *Funk Aircraft Co.*

Circle 39 on postcard for more data

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FREE LITERATURE

New Engine Group 1

Facilities and personnel of the Small Aircraft Engine Dept. are pictorially introduced in bulletin GEA-6115 now available from the *General Electric Co.*

Broaching Process 2

"Chips Tell the Story"—a 12-page booklet, tells just why and how broaching equipment is capable of producing parts so accurately and at such high rates of speed. *Colonial Broach Co.*

Coated Fabrics 3

Eleven new coated fabrics added to the line on the first anniversary of the Mechanical Products Div. are specified in a catalog sheet available from *Haartz-Mason, Inc.*

Liquid Filters 4

A four-page illustrated folder, F 10-54, describes a line of permanent membrane type liquid filters. Clarification of solutions is made by filtering acid, alkaline or neutral liquids through a series of permanent membranes (wire well screen, porous stone or porous carbon) caked with diatomaceous earth, to remove suspended particles down to 1/10 micron. *Filter Div., Wagner Brothers, Inc.*

Batch Ovens 5

Convection batch ovens for laboratory testing and small parts production, either electric or gas-fired, are shown and described with prices in a two-page bulletin. *Burdett Mfg. Co.*

Lost Wax Casting 6

A picture story of the lost wax investment casting process is presented in a handy booklet by *Howard Foundry Co.*

Mass Spectrometer 7

The portable model 21-610 mass spectrometer, suitable for process monitoring and control, is described in interesting terms in bulletin CEC-1824A. *Consolidated Engineering Corp.*

Resins 8

Polyite polyester resins available are described in a series of 11 technical bulletins in a handy file folder, published by *Reichhold Chemicals, Inc.*

In Line Valves 9

Bulletin 4010 covers two- and three-way in line valves, either solenoid-controlled, pilot-operated, or remote air controlled. *Numatics Operating Valve.*

(Please turn page)

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Speed Drive 10

Catalog M-543 describes completely the new design of the fractional horsepower Vari-Speed Motodrive. It also gives list prices for all units, controls, and modifications. The unit is available in ¼, ⅓, ½ and ¾ hp capacities in speed ratios of 2:1 through 10:1. *Reeves Pulley Co.*

Press Brakes 11

Bulletin 89-C, 32 pages, introduces a complete new line of Niagara press brakes, describing double end twin drive, sealed oil baths for gearing, laminated non-metallic ways and the electro pneumatic clutch. *Niagara Machine & Tool Works.*

Laminated Parts 12

Examples of Insurok laminated plastic and molded plastic items are displayed in a four-page circular by *The Richardson Co.*

Hydraulic for Plastics 13

Hydraulic equipment for the plastics industry—pumps, presses, accumulators—are covered in 12-page catalog No. 5200-A. *Elmes Engineering Div., American Steel Foundries.*

Phenolic Resins 14

Twenty-eight technical bulletins on phenolic resins for bonding, laminating, impregnating and casting applications are collected in a handy folder. *Reichhold Chemicals, Inc.*

Furnaces 15

A catalog page recently published pictures and describes soft-metal reverberatory furnaces made by *Eclipse Fuel Engineering Co.*

USE THIS POSTCARD

Hydraulic Drives 16

Oilgearducers, packaged hydraulic drive output units consisting of constant displacement axial piston motors integral with Falk concentric and right angle all-steel reducers, are described in eight-page bulletin 56610. *The Oilgear Co.*

Boxes, Skids 17

Catalog Adv. 620 on materials handling equipment describes the principal products of the Pressed Steel Div., including steel boxes, skids, pallets, foundry flasks, and stampings. *Republic Steel Corp.*

Tool Control 18

A folder describing in detail its recently introduced tool control unit, is available from *Cross Co.*

Winch 19

A catalog (A-5225) describing a hydraulic winch system for airborne applications is now available from *Vickers Inc.*

Shapers 20

Ready for distribution is a 12-page bulletin (No. 1800-54) summarizing the Shear-Speed shaper line. *Michigan Tool Co.*

Production Welder 21

Bulletin No. 313-12 is available covering the SX 36 G standard multiple electrode machine for high production resistance welding applications. The SX 36 G consists of a universal multiple gun base with two independent platen units which load in extended position—swing-in and lift to the welding position—and after the welding sequence is completed, retract and swing-out for unloading. *Sciaky Bros., Inc.*

Aluminum Data

The 1954 edition of "The Aluminum Data Book" has just been issued. It offers 220 pages of detailed data on the properties and characteristics of aluminum. Write on company letterhead to *Reynolds Metals Co., Desk PR, 2500 S. Third St., Louisville, Ky.*

Feeds and Speeds

A 36-page manual of tool angles, machinability ratings, speed and feed charts, general practice, coolant and horsepower for cutting ten types of materials, plus technical cutting data and nine reference tables is available by writing on letterhead to *The Monarch Machine Tool Co., Sidney, Ohio.*

VOID After Dec. 1, 1954 **10/1/54**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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Yes

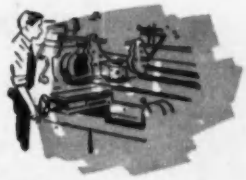
Leaded Steels Can Be Forged

This is our answer based on experience with many producers of forgings who have used leaded steels. Ledloy* and leaded alloy steels can be heated and forged in exactly the same manner as comparable standard steels.

No modifications in forging practices have been necessary is the report from users of leaded steels.

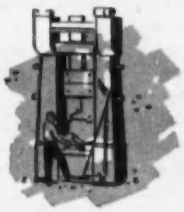
Leaded alloy steels and leaded carbon steels for forging are available in all standard or S. A. E. compositions and in any of our standard sections. Write today for complete information about application of leaded steels to your forged product.

*Inland Ledloy License



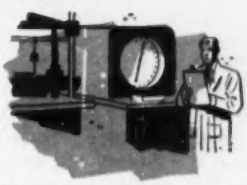
Are leaded steel forgings readily machinable?

Yes, the use of leaded steel forgings will result in the same improved machinability as is obtained in leaded steel bars.



Loss of lead due to heating?

Investigation has shown that the exudation of lead upon heating leaded steels is confined primarily to the scale. The lead content in the forging proper remains virtually intact.



Does lead affect mechanical properties?

No, the addition of lead does not materially affect the mechanical properties of forging.

Is there a health hazard?

Not generally. With ventilation normally required in forge shops, the use of leaded steels does not present a hazard.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY • STEEL DIVISION • WARREN, OHIO

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For export—Copperweld Steel International Company, 117 Liberty Street, New York

Farnborough Air Show

(*Continued from page* 51)

pressurized, high-wing monoplane of all-metal stressed skin construction with a single fin and rudder, its gross weight being 34,000 lb. It is significant that at a time when the British are devoting so much attention to turbines that Handley Page should decide on four piston engines. These are the Alvis Leonides Magor, each developing 870 hp for take-off. Three blade constant-speed Hamilton propellers are used, and there are four bag-tanks in the center section of the wing carrying 700 Imp gal of gasoline. The firm states that the piston type engine is preferred by the majority of operators whose machines must fly from small fields, and also because it is not affected by high-altitude tropical airstrips. However, the firm is prepared for a change to propeller-turbines as they are further developed.

In contrast to this, Bristol is placing all the emphasis on the Britannia with four Proteus 705 turboprop engines of 3780 equivalent horsepower. The first fifteen are for BOAC; this is part of an order for 35 aircraft in all. After this first batch, the Britannia will have the Proteus 755, giving 4150 hp. So far, 60 Proteus engines have been built and run, and as a flying test-bed only this engine is being used on the Ambassador.

Despite recent accidents, De Havilland maintains that its Comet program will be continued. Both the Comet 2 and the Comet 3 were on the ground and were shown in flight. Although the findings of the commission of inquiry had not been made known when the display opened, it is maintained that the 2 and the 3 will be continued, the former with 13,000 lb payload and the latter with either 16,800 lb or 19,500 lb (58 or 76 passengers).

The situation with regard to the three V's — Avro Vulcan, Handley Page Victor and Vickers Valiant— appears to be that the Valiant will be the first to go into squadron service, probably in March. No decision has been taken on the Vulcan or the Victor. The last mentioned, after making its first flight in 1952, crashed this year, apparently due to a faulty tailplane. The makers claim that the cause of the defect has been discovered, but for safety reasons it is not being disclosed. The Gloster Javelin delta-wing, twin-jet, all-weather fighter is expected to go into service next year. There does not appear to be entire satisfaction regarding the Hunter and the Swift jet fighters, neither of which in present form can travel faster than sound in level flight. In consequence there is doubt about the advisability of putting these into regular production. It is this long delay between the first appearance of a prototype and its readiness for active service which is giving headaches to the British aviation authorities and the industry.

Improved Suspension for Trailers

(*Continued from page* 57)

the cammed surface of the spring hanger which in light load position engages only the ends of the two top spring leaves. This provides maximum spring action to afford easy riding when riding "light." As loads are increased the heavier weight flattens the spring leaves and the active length of the spring is shortened and thus automatically made stiffer in correct ratio to the increased weight carried. Alignment is held by radius rods which keep the springs in their proper relative positions beneath their bearing surfaces regardless of whether on or off the road operation.

With this suspension the only duty performed by the spring is to act as a load cushion. Backward and forward thrusts of stopping and starting are taken by radius rods. Since these rods are adjustable they can always be restored to alignment should any displacement occur in service. These radius rods are also rubber mounted at both ends to reduce shock and wear.

Total automobile credit outstanding at the end of 1953 was $10,289 million. This figure was a $2,190 million increase over the figure of a year earlier.

•

There are 140,000 school buses in operation today in cities and towns as well as in the country.

•

Altogether, today, there are about 250,000 buses operating in the U. S.

•

Horsepower in aircraft engines increased at an average rate of 65 hp per year between World War I and World War II. Between World War II and today the increase averaged 2800 hp per year.

•

More than $4.6 billion will be spent by the U. S. oil industry in 1954 to expand and develop its resources and facilities.

•

Car thieves in 1953 stole 226,530 automobiles — 11,220 more than in 1952—an increase of 5.2 per cent. Police reported the value of the average car stolen as $1,038, and 93.9 per cent of the stolen cars were recovered. This indicates 13,818 stolen cars unrecovered in 1953, or an unrecovered loss of over $14 million.

•

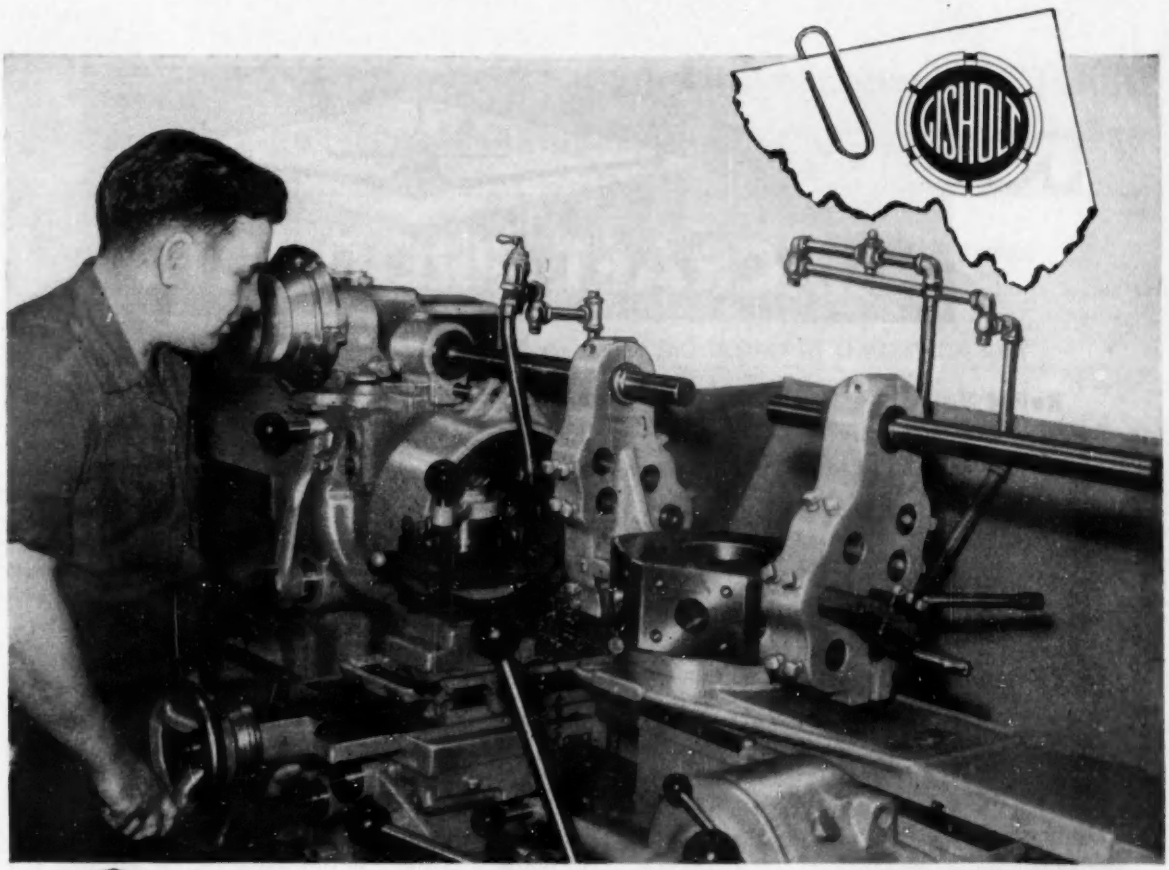
The cost of finding oil in the U. S. today is about six and a half times what it was back in 1935-39.

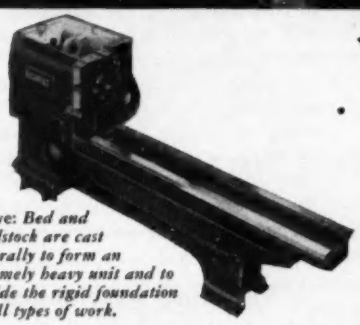
•

Today's average automobile lasts nearly 14 years and rolls up four times the mileage of a 1923 car.

•

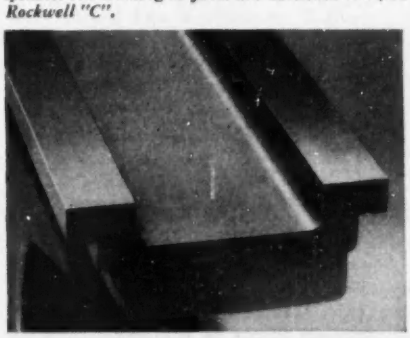
There are 116,743 major units of government in the U.S. today. This figure includes the Federal Government, the governments of the 48 states, 3049 counties, 16,778 municipalities, 17,202 townships, 67,346 school districts, and 12,319 special districts.





Above: *Bed and Headstock are cast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.*

Below: *Block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".*



ACCURACY THAT DOESN'T "WEAR OFF"

Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and maintain—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid support possible.

Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

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Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Relief Valve

A special series of compact double-acting relief valves for aircraft oil hydraulic systems is available. Con-

sisting of a conventional aircraft relief valve and four poppet-type check valves combined in a single housing, the units require only four pressure connections for installation. Designated series AA-31350, the new combination valve is provided with tapped pressure connections or can be made to accept O-ring sealed flange-type mountings. The valves are adjustable for relief conditions within the pressure range (cracking pressure) of 900 to 4100 psi.

A special port in the housing to permit venting (dumping) the hydraulic system is provided as required. An external lever control can be provided for momentarily increasing the normal relief pressure setting. Depression of the lever permits short term system overload operation as emergencies demand.

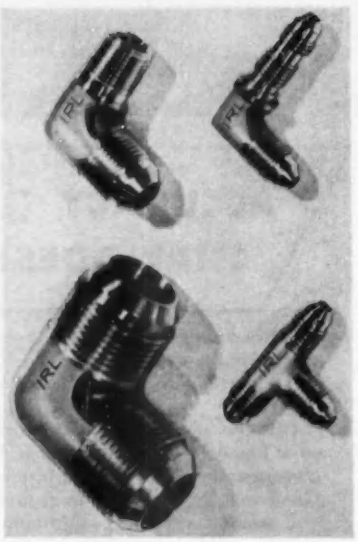
Applicable to any two directional installation, series AA-51350 valves are claimed to save weight, space, and cost in armament circuits, electro-hydraulic devices, and other aircraft servo systems. Reversing actuating cylinders can also be protected with double relief valves. A typical installation is the use with the reversing motor in airborne winch installations. *Vickers, Inc.*

Circle 46 on postcard for more data

Stainless Fittings

Stainless steel fittings produced by the centrifugal casting method to standard AN specifications or to special requirements are said to cut costs as much as 15 per cent.

At a recent test at the Wright Field

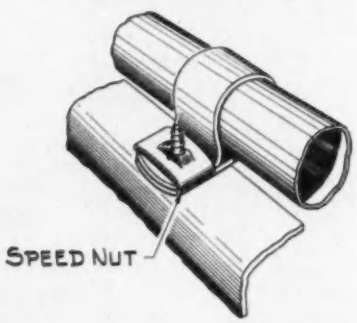


Development Center, the Air Force subjected an IRL centrifugal cast stainless steel fitting to hydraulic pressures of 12,000 psi for an eight-hour period with no leakage or seepage. Further tests increased the pressures to 22,500 psi in an attempt to burst it, but the fitting held up without any leakage, distortion or damage. *Industrial Research Laboratories.*

Circle 47 on postcard for more data

Tube Clamp Nut

Offering rapid installation of Type AN 742 aircraft tube clamps is a new flat-type Speed Nut. It features rounded corners and turned-down ends which bear against the upper leg of the clamp to prevent the fastener from rotating after assembly. It



is positioned over the mounting hole and secured with an AN 530-8 or 530-10 screw to provide a firm, vibration-resistant attachment. Designed for application to any ½-in.-wide strap or flange with a minimum thickness of 1/16 in., the new nut is very light in weight. *Tinnerman Products, Inc.*

Circle 48 on postcard for more data

Slip Ring Assemblies

An insulation material for high temperature slip ring assembly applications, ETC-7, is said to withstand −60 F to +500 F and to offer low water absorption, high surface resistivity, and excellent impact strength and dielectric properties. *Electro-Tec Corp.*

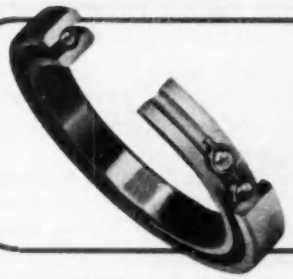
Circle 49 on postcard for more data

Mounting System

The No. 750 mounting system for communications equipment incorporates special bars for limiting the sway space requirements on high and narrow pieces of equipment in addition to insuring level return of equipment after high loading. *Federal Shock Mount Corp.*

Circle 50 on postcard for more data

ENGINEERING COOPERATION AND DESIGN ASSISTANCE
Bring You The Advantages Of Ball Bearings Like These

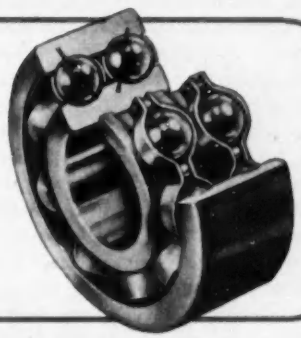


BCA XLS BEARINGS for applications where space is limited

BCA XLS Bearings are especially useful where space is limited and where weight must be held to a minimum—these Conrad type bearings, made to inch boundary specifications, feature a smaller bearing section for a given shaft diameter. They are suitable for any combination of radial and thrust loads. BCA XLS Bearings are used in metal turning machines, earth-moving and other equipment.

BCA 5200 and 5300 SERIES bearings can carry any combination of radial and thrust loads

BCA 5200 and 5300 Series Bearings are double-row bearings of the angular contact, maximum capacity type. The maximum load-carrying capacity is the result of the larger ball size in BCA design. The vertex of the contact angle, between the balls and the raceways, falls within the bearing. This construction insures enough flexibility to compensate for mounting inaccuracies without sacrificing the rigidity required in many double-row bearing applications. These bearings can be furnished with shields and lock ring grooves.

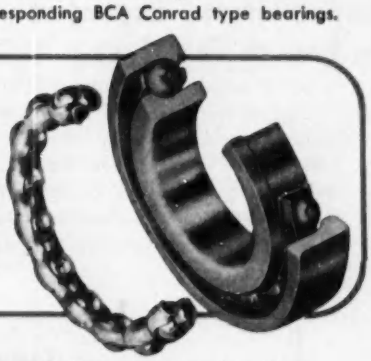


BCA 1200 and 1300 SERIES bearings for HEAVY loads

These BCA maximum capacity type bearings meet the heavy duty requirements of service in farm tractors, road machinery, power shovels, earth-moving equipment, and special materials-handling vehicles. Additional balls are introduced between the raceways thus increasing radial load carrying capacity to a maximum. BCA 1200 and 1300 Series Bearings are made to the same standard metric boundary dimensions as corresponding BCA Conrad type bearings.

BCA ANGULAR CONTACT BEARINGS for maximum performance

BCA Angular Contact Bearings feature a sturdy, one-piece S-section retainer. There are no rivets to work loose, and the design of the retainer permits construction that is fully angular-contact on both outer and inner rings. Low, medium, and high angles of contact are available in both light and medium series bearings. These BCA Bearings have the ability to carry any combination of radial and thrust loads. Thrust loads are taken in one direction only.



BCA engineering cooperation and design assistance are available to help solve *your* problems involving ball bearings.

BCA AGRICULTURAL BEARINGS save installation and service time

BCA engineers, working with manufacturers of farm equipment, have developed a line of low-cost bearings—pre-lubricated *package units*—designed to save installation time for the equipment manufacturer and service time for the farmer. BCA Cam Follower Bearings, Wheel Bearings, Idler Pulley Assemblies, Flange Bearings, and Hay Rake Bearings already have been proved in use in the equipment of many leading manufacturers.

radial, thrust, angular-contact Ball Bearings

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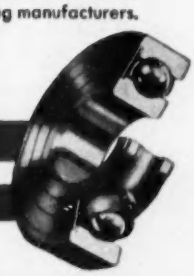


METALS

Lead and Zinc Prices Upped by Government Purchases. Copper Supply Is Tight, Due to Strikes in the United States and Chile.

By William F. Boericke

Slow Pickup in Steel

Steel demand showed a spotty improvement after Labor Day but it was reluctantly admitted that bookings were not picking up as well as they should. Nevertheless, there was a modest increase in new orders in September. Unfortunately, the orders don't involve substantial tonnage. Warehouse sales are reported to be up rather substantially, although they have been accompanied by some price cutting.

Steel base prices remain firm and steel men believe their products are still underpriced on a comparative basis with other commodities. But besides forcing producers to absorb freight, consumers have become quality conscious and demand delivery of better quality steel. This makes selling more difficult for some small or marginal producers who failed to modernize their plants, and for large producers who put volume ahead of quality. The net result is that while base prices nominally hold, profits have suffered.

Improvement Expected In Fourth Quarter

The belief is gaining ground that steel output in the second half of the year will fall 10 per cent below the 44 million ton production in the first half. The industry looks hopefully to October to signal the long awaited upturn but signs of improvement are none too sure. October is regarded as a test month. Substantial orders are expected from Detroit that will hold through the fourth quarter. On the other hand, orders will decline seasonally for construction work, oil wells, and farm equipment.

Oil country goods have heretofore been a mainstay in a listless steel market. Early in September the demand appeared to soften suddenly for seamless tubing and drilling equipment. Increased competition from foreign producers was blamed for price cutting, as much as $5-$15 per ton under the domestic price.

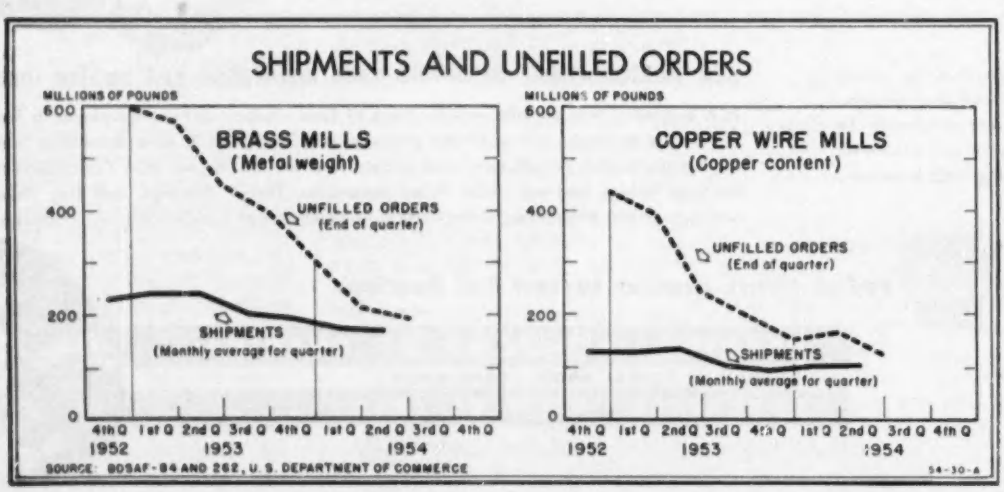
Galvanized Products In Good Demand

Structurals continue strong and galvanized sheets are still the tightest of all flat rolled products. Tin plate demand is steady and was not affected by the two per cent price increase announced by U. S. Steel, to bring the price in line with the general increase for steel products made last July. Cold rolled sheets show some improvement as orders from the automobile industry trickle in. But orders from manufacturers of railroad equipment, non-electric industrial machinery and shipbuilding were few in September.

Alloy Steel Perks Up

Producers of alloy and stainless steel see better days ahead with the expected surge of orders from the automobile industry. Steel buying for new models should appear first in alloy and stainless steel products which need longer production cycles. Some improvement in demand for these sorely depressed products is already visible.

(*Turn to page* 104, *please*)



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We can be reached directly or through your local Hy-Pro jobber. A complete line of top quality Hy-Pro taps plus our specialist engineers can help cut man-hours from *your* production schedule.

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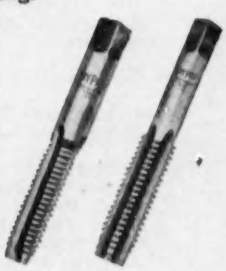
HY-PRO



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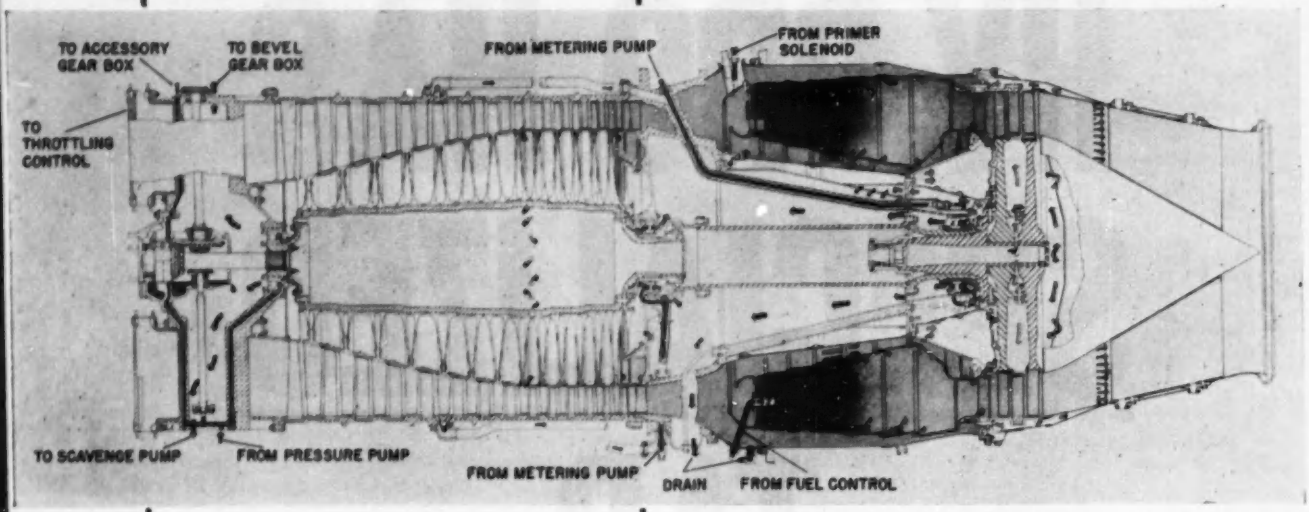


Sectional drawing of J-65 turbojet showing air, oil and fuel flow lines

1—Manufacturer's Designation: TJ31A.

2—Name or Military Designation: YJ65-W-1 and YJ65-W-1A.

3—Type: Turbojet.

4—Propeller Drive: None.

5—Air Intake: Type: Annular. Location: Front.

6—Compresser: Type (axial); Multi Stage.
I—Impeller (centrifugal): None.
II—Rotor (Axial): Material: Aluminum and Steel. Number of stages: 13. Type or design: series of disks. Attachment to shaft: shrunk. Type of bearings: Roller and ball. Casing, type and material: Aluminum casting—split. Blades: Material: Stator blades: steel. Rotating blades: steel and aluminum. Method of attachment: To Stator: Serration. To Rotor: Fir tree and rivets.

7—Combustion Chambers: Type: Single annular. Material: Outer casing: Stainless steel. Flame Tube: Special. Burners: Type: Vaporizing. Location: Annular in front end of combustion chamber.

8—Fuel System Type: Low pressure. Components: Booster pumps, main pump, control, flow dividers. Control system: Scheduling control with topping proportional governor. Water injection: None.

9—Fuel Grade: Mil-L-5624A, Grade JP4.

10—Nozzle Guide Vanes: Type: Air Foil. Material: Nickel—base alloys.

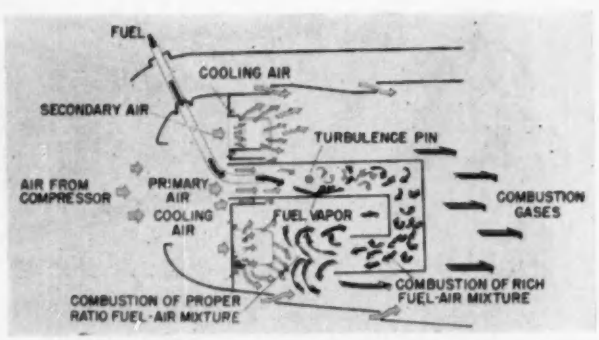
11—Turbine: Type: Pressure. Number of stages: 2. Turbine disk: Material: Steel. Method of attachment to shaft: Taper Pins. Bearing location and type: Roller in front of disk. Blades: Material: Nickelbase alloys. Method of attachment to disk: Fir tree. Gas Temperature: Before turbine: 1476 F. After turbine: 1112 F.

12—Jet Pipes: Type: fixed. Material: Cone: Steel. Jet Pipe: Steel.

(*Turn to page* 124, *please*)

Details of J-65 Turbojet

DECLASSIFIED specifications of the Curtiss-Wright J-65 turbojet, which is in production at the C-W plant in Wood-Ridge, N. J., and at the Buick plant in Flint, Mich., are listed here. This engine is now used in the North American FJ-3 Fury, Douglas A4D Skyhawk, Lockheed F-104, Republic F-84F Thunderstreak and RF-84 Thunderflash, and Martin B-57 twin-jet bomber.



Fuel vaporizing and combustion pattern in the J-65 is shown in this schematic drawing

Automation Requirements Among Subjects Discussed at ASME Fall Meeting

AMONG the noteworthy sessions at the American Society of Mechanical Engineers fall meeting held in Milwaukee in September was a symposium on the general topic—What does the production engineer expect from machine tools? Four speakers handled as many facets of the question in brief outline form.

Perhaps of widest interest to production men was the matter of machine tools for automation requirements. N. L. Bean, Ford Livonia Plant, covered the subject from a purely general standpoint, confirming some of the major criteria applied to transfer machines. He commented on the need for forward planning as well as bold decision in the adoption of automation where it is justified. Among the requirements of such equipment, he listed the following:

1. Good quality control
2. Freedom from down time—low maintenance
3. Ease of loading and unloading
4. Development of basic locating points
5. Insistence upon JIC standards

Mr. Bean suggested that thought be given to some form of sensing device or torque control that could spot dull tools, and so prevent damage to the product or the equipment.

How the problems of jet engine producers are to be met was discussed by Michael Field, Metcut Associates. His presentation, primarily in the form of slides, was concerned specifically with manufacturing research at Curtiss-Wright. Jet engine manufacture appears to be in an extremely fluid state, and poses problems rarely encountered in automobile production. First is the matter of variety of materials—ranging from the easy machinable aluminum and magnesium alloys, to hard-to-machine materials such as heat resistant alloys and titanium, to comparatively unmachinable materials such as Stellite.

If the material problem were not enough of an obstacle, there is the matter of special product design such as compressor disks—say 30 in. in diameter, with a web 0.050 in. thick which must be flat and true and without residual stress; complex turbine blading; large engine casings, etc. If this were not enough, the author points out that design changes are constantly being made and there is always the risk that a given engine design may be obsolete before it is completely tooled.

Because of such variability, and a shifting base, jet engine manufacture has become a matter of methods research rather than processing in the usual sense. Special machines must be employed, of course, but generally speaking it is not safe to plan for multiple-spindle operations or special purpose equipment with a multiplicity of heads and stations. While each operation has to be studied carefully to come up with a good solution, research must be prepared to change the whole setup if difficulty or lack of control is encountered. At the present time, it is apparent that the jet industry has no ground rules or standards that may be applied with confidence.

The situation has further complications. At the present time the large engine casings are of easily-machinable aluminum alloy, handled on heavy duty T-lathes, using mist cooling for best economy. But Dr. Field points out that future demands on these powerplants will require casings of steel and ultimately of titanium. That will pose some new and even more difficult machining problems.

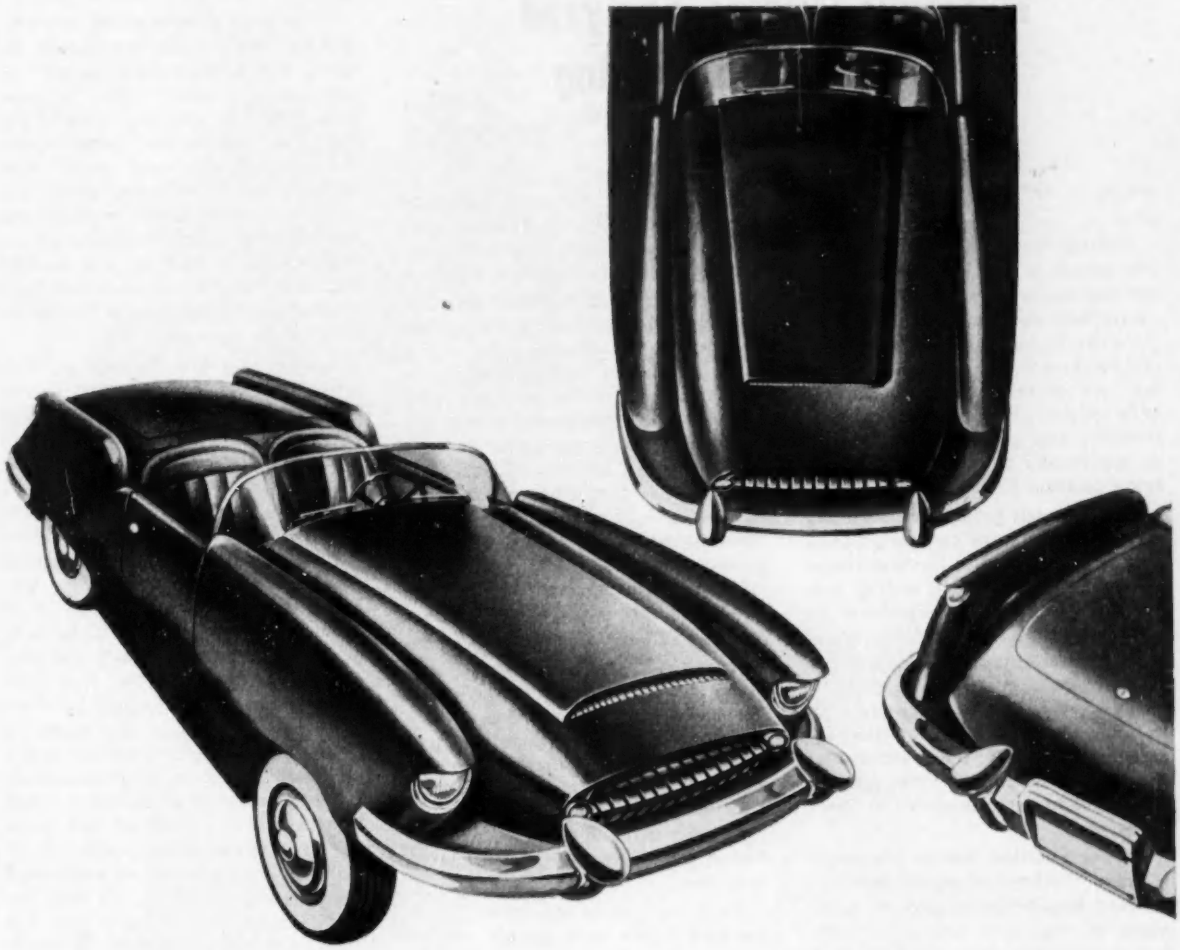
C. H. Borneman, General Electric Co., and C. J. Oxford, Sr., National Twist Drill, presented parallel pointed discussions on machine tools for small lot production and for best tool performance. Requirements for both include the following: adequate structural rigidity; adequate power; adequate selection of speeds and feeds; proper arrangements for coolant—at the right place, with sufficient volume and pressure; and arrangements for chip removal.

Another interesting forum presented on the subject "How can the production engineer apply the results of metal cutting research?" had seven specialists, each of whom was required to analyze a specific group of current research projects. The panel consisted of the following: A. B. Albrecht, Monarch Machine Tool Co.; Prof. O. W. Boston, Univ. of Mich.; E. H. Lee, Brown University; M. Eugene Merchant, Cincinnati Milling Machine Co.; E. T. Newbauer, The Trane Co.; Jesse Sdano, Allis-Chalmers Mfg. Co.; and Prof. M. C. Shaw, MIT.

The gist of it was that research in the field of metal processing has been underway among many of the machine tool manufacturers, among metal producers, and in engineering schools for a considerable length of time; and that it is advantageous for industry to evaluate present results in the light of trends that may be of practical value. The general consensus was that fundamental research in this field has a diversity of aspects and is of such long range character as to bar immediate practical application. However, certain directions may be noted and practical research, if evaluated properly and applied to shop conditions, can lead to optimum machining.

This would apply, in particular, to specific research

(*Turn to page* 102, *please*)



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Hydraulic Devices Analyzed at SAE Tractor Meeting

(*Continued from page* 63)

taxpayers in filling war-time pipelines.

Shifting the scene to the production panels, it may be noted that this meeting marked the third time that forum meetings have been held this year. It is obvious that under the circumstances one cannot expect to find new or unique developments at each session. However, the constant turnover does give many individuals an opportunity to exchange ideas and share common problems.

A persistently prominent query was evident in the inspection panel. Statistical quality control has penetrated throughout the industry and by now many people have been exposed to its virtues. Uppermost today is the question of process capability, i.e., whether the equipment in any given plant is really capable of producing work to the tolerances specified by the designer. Many of the participants questioned whether the older existing equipment has ever produced to tolerances.

If it is true that process capability is below the level of established theoretical requirements, and if parts made in the past have been used without rejection, then it follows that perhaps tolerances are not realistic.

Observation shows that in many instances today manufacturers are taking a good look at existing equipment and many of them are buying new machinery capable of maintaining a higher level of finish and accuracy where this has become essential. This feature alone, as uncovered by statistical quality control procedures, means more in the procurement of new types of machine tools than does the element of obsolescence.

A general discussion of this subject —process capability—brought out the fact that a selected group of companies recently analyzed receiving inspection data, and found that purchased parts and material showed wide deviations from specifications. Yet it was evident that none of the material was being rejected. Consequently, it was being consumed in regular production despite the deviations. Does this mean that the specifications are not realistic? Are these manufacturers kidding themselves? Does it mean that parts of many kinds can be made to less fussy specifications, perhaps at lower cost? Here is something that demands closer scrutiny in the near future.

The gear panel combined gear experts and metallurgists, realizing that modern gear production must rely to a major degree upon metallurgical skills. Many specific problems were discussed, not many necessarily new to practitioners of the art. One interesting point touched on cemented-carbide hobs. It was brought out that these enormously expensive tools still were confined to use on the very large diameter marine gears, but did not have practical applications on normal automotive gears.

Metal cutting drew a large group of people with many individual problems. It was of interest to learn that vapor blast cleaning is being widely used for finishing cutting tools primarily to remove burrs and sharp edges. It is being used for finishing hobs, after regrinding; and Ford is reportedly using the method for finishing draw dies, particularly large body dies.

As in the case of the ASME meeting held a few days earlier, several people inquired about the availability of some form of torque sensing device for drill spindles. This is unquestionably something that requires action on the part of progressive suppliers. On transfer machines, it was brought out, it appears more economical to rely upon the automatic gaging stations within critical sections of the machine to furnish a check on drill performance, coupled of course with the calibrated control of tool life such as is made available by the Cross Toolometer, and more recently by a similar device produced by Snyder.

One striking development, noted at this session, was the new deep hole drilling machine recently developed by Bryant, stemming from equipment supplied for gun drilling during WW II.

At the welding panel attention was drawn to the variety of modern spot welding equipment now being employed in producing jet engine parts. It was not surprising to find a word of caution as to the selection of such equipment on the basis of quality and performance rather than price.

Some ideas gleaned at the meeting: For one thing, there is a sudden demand for a good turbocharger for commercial engines. This is occasioned by the growing demand for industrial engines for irrigation, for portable oil rigs, and many other applications where large output engines are required. If a turbocharger can increase engine output by 50 per cent or more—and we are assured that some new ones can—it will be a great boon to the engine builder as well as the customer.

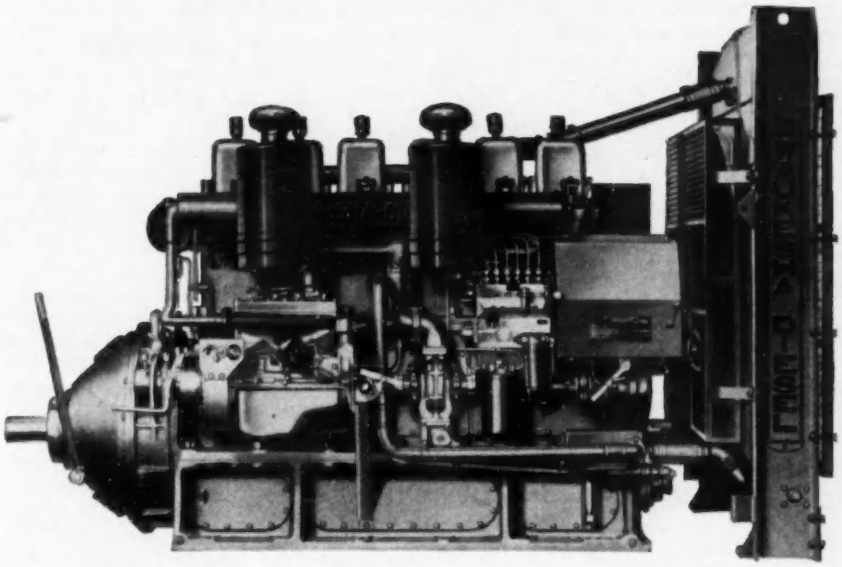
Cogmatic, a new division of Andwell Mfg. Co., demonstrated a new technique for producing sprockets and large gears. They employ a precision flame machining technique which produces an acceptable finish without further machining, surface hardening the gear teeth at the same time.

Reverting to the military engine standardization program, it was noted that means would have to be provided for salvaging crankshafts to permit use of standard main and connecting rod bearings. One idea is to build up the pin or journal by chromium-plating. While this might be feasible at a major overhaul depot, we are inclined to the view that metallizing by means of special guns would be much more economical and much more feasible as a field operation. In fact, we recall this was an authorized procedure by the Navy, not only for field repairs but in salvaging big crankshafts in production. It would pay the specialists in metallizing to study this problem and come up with some new tricks that would help everyone concerned.

Automation Requirements Discussed at ASME Fall Meeting

(*Continued from page* 100)

projects conducted by such organizations as Jones & Lamson, Monarch, Cincinnati Milling Machine, and others. For example, Albrecht mentioned that one of the products of the Monarch Machining Project is a new publication — *Speeds and Feeds for Better Turning Results* — now available for distribution. Another significant project is the chip breaker study completed last year under the sponsorship of the National Machine Tool Builders' Association.



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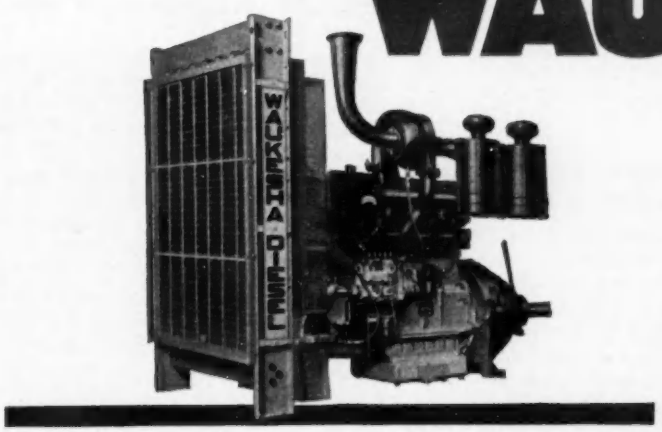

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THE STANDARD OF COMPARISON

METALS

(*Continued from page* 96)

A stiffening demand for steel scrap is a good omen. Prices advanced in September in several areas and raised the *Iron Age* composite price to $29 per ton. In Pittsburgh No. 1 heavy scrap rose to $31, the highest price paid since January.

Copper in Tight Supply

Copper supply is tight and likely to become tighter before the end of October. Strikes in August at important copper mines halted production for three weeks and caused a loss of at least 34,000 tons of metal. As it requires about 60-90 days to process mill concentrates into refined copper, a real pinch in supply will be felt in the fourth quarter. A short-lived strike at the huge Phelps Dodge refinery in El Paso, followed almost immediately by a strike at the Garfield Smelter of American Smelting added to producers' troubles.

This was not all. A serious work stoppage at two of the principal Chilean copper mines cut production from that country about 40 per cent, with possibility that the strikes might spread to shut down Chile's entire production of 30,000 tons per month, upon which consumers depend heavily to supplement domestic supply.

Price Up In London

Demand spurted sharply as the gravity of the situation was realized by consumers who had let their inventories drop below normal. Custom smelters were obliged to allocate their limited supply. Abroad the copper price mounted sharply on the London Metal Exchange to the equivalent of nearly 31 cents per lb, a full cent above the long established domestic price.

The stage is set for a higher domestic price for copper but it appears doubtful if it will gain approval of the principal producers. The present tight supply is believed strictly temporary. A lot of new production is due to come on the market from new mines here and abroad and the squeeze is only for metal for prompt delivery. Plenty of copper will be forthcoming when production is resumed.

Custom smelters are in a little different position. A considerable part of their requirements is met by purchases of scrap, which had advanced to 27 cents per lb by mid-September. It is freely stated that conversion costs require that the custom smelter should receive more than 30 cents per lb to break even, if scrap continues to sell at 27 cents. A price increase by the custom smelters might start similar action by the primary producers, for a dual market price for copper is unthinkable over more than a very short period.

Copper from the Stockpile

It is always possible that the President could proclaim a national emergency and release copper from the stockpile. This was done in 1951 under somewhat similar conditions of tight supply. However, it seems likely this would occur only if conditions became worse, although the stockpile now is much larger than it was a few years ago.

According to a Department of Commerce forecast, deliveries of copper wire products will increase in the fourth quarter and a much larger increase will be shown by brass and bronze products. Much of the optimism for the fourth quarter is based on completion of inventory liquidation of durable goods which has been going on since November last year.

Government Buying Boosts Lead and Zinc Prices

The zinc price was boosted ½¢ per lb early in September to 11½¢, with the trade confident it will go higher. This was the fifth advance since it sold at 9¼¢ in March. Shortly after, the lead price was advanced to 14½¢.

Higher zinc and lead prices are ascribed directly to the accelerated Government buying program. It is becoming more and more apparent that the Administration is determined to raise zinc and lead prices as a compensation for refusal to approve a tariff increase. While Washington refused to pay more than 11¢ per lb for zinc and 14¢ for lead when offers were originally requested for the stockpile, it is now willing to acquire the metals at the market, and if they are not forthcoming in sufficient quantity, probably to bid higher.

For the balance of the fiscal year ending next June, about 300,000 tons of zinc and 200,000 of lead will be bought for the stockpile. This means that over 70 per cent of the domestic mine output of zinc and lead will be off the market. Monthly mine output of zinc has been averaging about 40,000 tons, and of lead, about 25,000 tons.

Metal Stocks Expected to Decline

Larger Government purchases should reduce the present top-heavy stocks of lead and zinc substantially before the year ends. A start was made in July and August when stocks of zinc dropped from 201,000 tons to 193,000 tons at the month's end. But continued heavy buying is needed to reduce stocks to a normal figure.

Zinc consumption continues at a lower rate than earlier in the year. The latest price increase stimulated buying by the galvanizers, and it is expected the die casters will place heavier orders when the automobile industry gets back into high gear.

The market was helped by continuing advances in London where zinc leaped the equivalent of ⅞¢ per lb following announcement of the new stockpiling program. While foreign zinc will not be eligible for stockpile purchases, foreign producers are happy that they will not have to hurdle an increased tariff barrier. Thus both domestic and foreign zinc and lead producers are in a better frame of mind.

Zinc and lead futures have reflected this optimism by advancing steadily on the New York Commodity Exchange. Sentiment in the trade is more favorable to zinc than lead. A 14½¢ price for lead insures fair profits for efficient lead mines, but 11½¢ is still much too low for the majority of zinc producers, both here and abroad. An indication of this is seen in Canada, where lead production increased nine per cent for the first six months of the year, whereas zinc output was down 15 per cent, compared to 1953.

Mercury Sells At Record High Price

Mercury soared to the record high price of $305 per flask of 76 lb in mid-September, with the metal virtually unobtainable except in small lots. London and European buyers bid the same price. Continued scarcity of spot supply rather than increased demand has caused the rise in price, regarded as fantastic by most in the trade.

The scarcity has been promoted by barter deals made by Washington with Spain and Italy, swapping their mercury for U. S. surplus grain. In an effort to build up the stockpile to about 300,000 flasks, the Government has also offered to buy 200,000 flasks of domestic mercury at $225 per flask over the next three years.

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National Aeronautic Meeting, Statler Hotel, Los Angeles...Oct. 5-9

Paris Automobile Show, France.Oct. 7-17

AIEE Fall General Meeting, Morrison Hotel, Chicago, Ill. ....Oct. 11-15

AMA Fall Manufacturing Conference, Plaza Hotel, New York, N. Y. .....Oct. 11-13

National Industrial Conference Board, third annual conference on atomic energy in industry, Hotel Commodore, New York, N. Y. .....Oct. 13-16

National Conference on Industrial Hydraulics, Sheraton Hotel, Chicago, Ill. .....Oct. 14-15

ASME-ASLE, first annual lubrication conference, Lord Baltimore Hotel, Baltimore, Md..Oct. 18-19

SAE National Transportation Meeting, Sheraton-Plaza Hotel, Boston, Mass. .....Oct. 18-20

National Safety Conference and Exposition, Chicago, Ill. .....Oct. 18-22

International Motor Show, Earls Court, London, England ...Oct. 20-30

American Society for Quality Control, eighth New England conference, Ten Eyck Hotel, Albany, N. Y. .....Oct. 21-23

American Gear Manufacturers Association, semi-annual meeting, Edgewater Beach Hotel, Chicago, Ill. .....Oct. 24-27

National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco..Oct. 25-27

AIEE Machine Tool Conference, Statler Hotel, Detroit, Mich..Oct. 25-27

SAE National Diesel Engine Meeting, Statler Hotel, Cleveland, Ohio .....Oct. 26-28

American Society of Body Engineers, annual technical convention, Rackham Memorial Bldg., Detroit, Mich. .....Oct. 27-29

National Metal Congress and Exposition, International Amphitheatre, Chicago, Ill. .....Nov. 1-5

Fourth Transport Aircraft Hydraulic Conference, Park Shelton Hotel, Detroit, Mich. .....Nov. 3-4

SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. .....Nov. 4-5

Association of National Advertisers, annual meeting, Hotel Plaza, New York, N. Y. .....Nov. 8-10

Industrial Tool & Equipment Show, Montreal, Canada .....Nov. 8-12

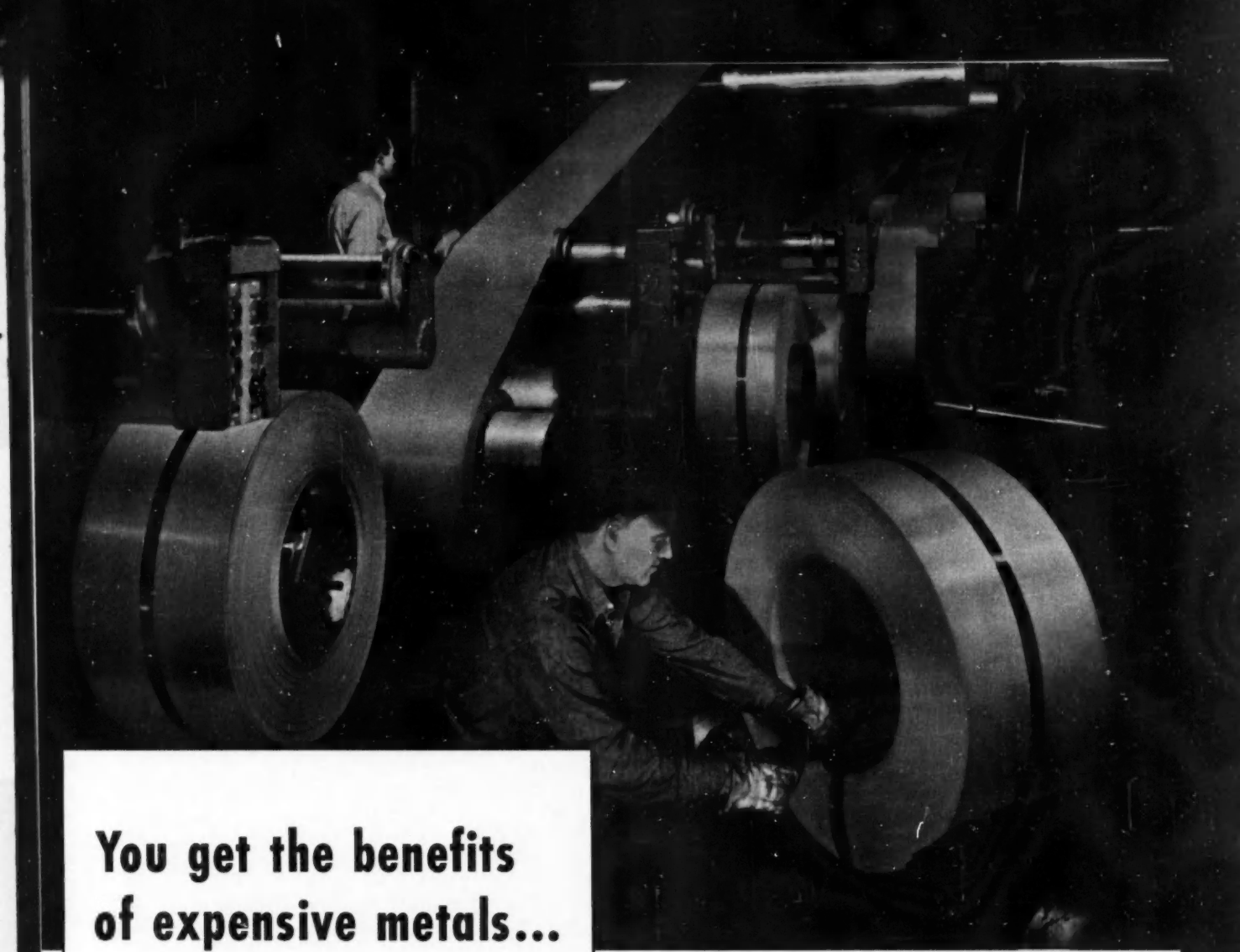
Gray Iron Founders' Society, annual meeting, Homestead, Hot Springs, Va. .....Nov. 11-12

Magnesium Association, tenth annual meeting, Hotel Chase, St. Louis, Mo. .....Nov. 15-17

Pan-American Road Race, Mexico, Nov. 19-28

ASME, annual meeting, Statler Hotel, New York, N. Y..Nov. 29-Dec. 3

First International Automation Exposition, 242nd Coast Artillery Armory, New York, N. Y., Nov. 29-Dec. 3



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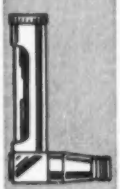

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NEWS

NO. 7 — 1954

Bearings of Du Pont TEFLON® have low coefficient of friction, are self-lubricating

In the automotive field, an engineering resin material with unusual properties promises new solutions for bearing design problems. It is Du Pont "Teflon" tetrafluoroethylene resin.

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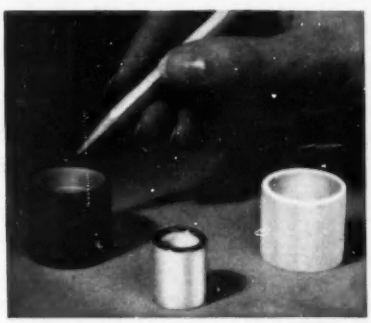

Laboratory tests showed that bearings of "Teflon" like these were still in satisfactory condition after 1,000 hours' operation with 20 p.s.i. projected area load at 1500 r.p.m.

Bearings of "Teflon" (see cut) are self-lubricating. Shafts, therefore, do not have to be mirror-finished, although a finish of RMS-15 is recommended.

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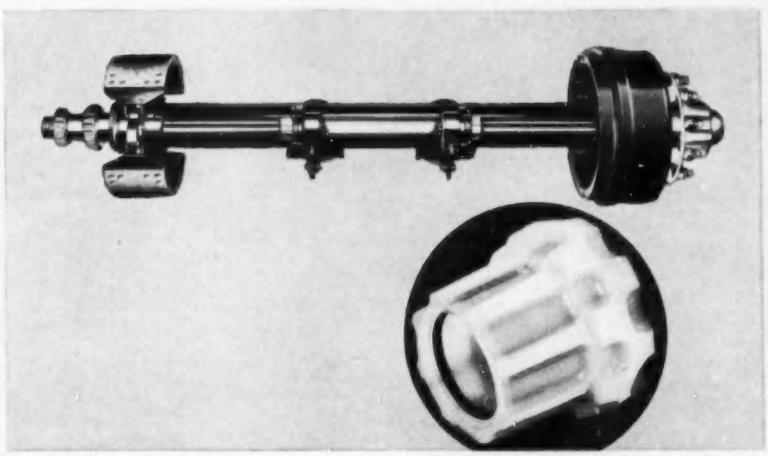
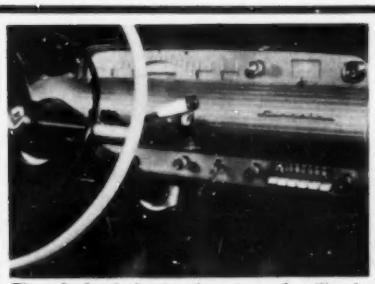
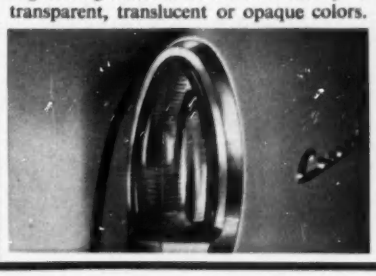


Bushings molded of "Zytel" nylon resin are used by the Timken-Detroit Axle Division, Rockwell Spring and Axle Company of Detroit, Michigan. Molder is St. Clair Plastics Corporation, Marine City, Michigan.



There's both lasting beauty and utility in these fixtures of Du Pont "Lucite" acrylic resin. This shatter-proof, corrosion-resistant engineering material comes in a variety of transparent, translucent or opaque colors.



Brake camshaft assemblies can pose a lubricating problem. Bushings are hard to reach—are frequently neglected or lubricated improperly.

To beat this problem, the Timken-Detroit Axle Division, Rockwell Spring and Axle Company has now standardized on bushings molded of "Zytel" nylon resin for its brake camshaft assemblies. They tested many materials in the laboratory and field and found "Zytel" afforded advantages possible with no other engineering material. "Zytel" does not rust or corrode. Camshaft wear is minimized if lubrication is neglected. Galling and brinelling of the brake camshaft have been eliminated completely. And these bushings of "Zytel" are remarkably abrasion resistant to assure long service life.

(*Continued, column 1 back side*)

OVER

*"Zytel" is the new trade-mark for Du Pont nylon resin.

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PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

NEWS

NO. 7 — 1954

"Zytel" *(Continued)*

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"Zytel" offers other advantages. It is resilient so bushings don't flatten out after long mileage. It is lightweight and has good impact strength. "Zytel" is unaffected by a continuous operation to 250°F. and remains dimensionally stable in freezing weather. Costs, too, are often reduced because parts of "Zytel" can be mass-produced in multi-cavity dies by economical injection-molding.

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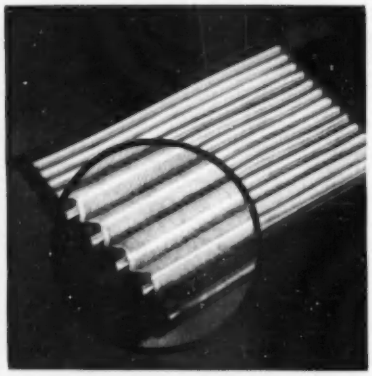
Many times Du Pont "Zytel" has just the properties automotive engineers need to beat a tough design or operating problem. Its versatility has been proven time and again in the automotive field. For complete information on this unique engineering material, its properties and how it's processed, simply mail the coupon.

New weather-resistant black "Zytel" 105 nylon resin for outdoor use is now available

This black "Zytel" 105 nylon resin is a tough material with excellent outdoor weatherability. Results of accelerated weathering tests and exposure, in Florida, indicate that excellent outdoor life can be expected. Toughness, abrasion-resistance, and form stability at high temperatures are combined with lightness of weight to make "Zytel" ideal for many outdoor applications.

In the agricultural field, "Zytel" 105 is suitable for such components as gears, sprockets and seeding plates. The chemical resistance and weatherability of black "Zytel" make it an excellent material for many marine hardware applications. Used for hub caps, directional signal light housings, and brake air line connectors, this new material offers new design techniques to the automotive industry. In the electrical field, switch plates, low voltage terminal boxes, and instrument covers are just a few of the many possible uses.



Storage battery uses positive plate with slotted tubes of "Alathon" polyethylene resin. This unique slotted tube construction exposes more active material to the electrolyte, providing greater battery life. Du Pont "Alathon" gives these tubes strength, flexibility, resistance to electrolyte corrosion and erosion. (Manufactured by Electric Storage Battery Co., Philadelphia, Pa.)

Investigate Du Pont engineering materials in your product development programs

One of the family of these versatile engineering materials is often a key factor in product improvement or new product design.

The wide range of properties available with "Alathon"* polyethylene resin, "Lucite"* acrylic resin, "Teflon"* tetrafluoroethylene resin, and "Zytel"** nylon resin are helping solve industrial design problems.

NEED MORE INFORMATION?

Clip the coupon for additional data on the properties and applications of these Du Pont engineering materials.

E. I. DU PONT DE NEMOURS & CO. (INC.)
Polychemicals Department
Room 1710, Du Pont Building, Wilmington 98, Delaware

Please send me more information on the Du Pont engineering materials checked: ☐ "Zytel"; ☐ "Alathon"; ☐ "Teflon"; ☐ "Lucite". I am interested in evaluating these materials for:

_____

NAME_____ TITLE_____

COMPANY_____

STREET ADDRESS_____

CITY_____ STATE_____

TYPE OF BUSINESS_____

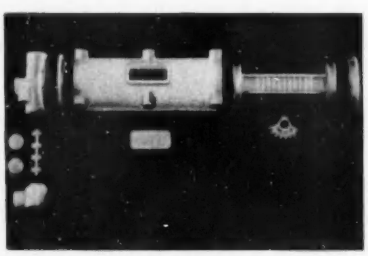
*"Alathon", "Lucite", "Teflon" are registered trade-marks of E. I. du Pont de Nemours & Co. (Inc.)
**"Zytel" is the new trade-mark for Du Pont nylon resin

POINTERS ON PROCESSING

Dimensional tolerances with molded "Zytel" nylon resin.

Because Du Pont "Zytel" nylon resin is used more and more today for all types of mechanical applications, a natural question raised by design engineers is: How close can dimensional tolerances of "Zytel" be maintained, compared with other engineering materials?

Experience shows that tolerances obtainable with "Zytel" by injection molding techniques compare very favorably with those of equivalent machined metal parts intended for interchangeable use in assemblies, and are generally superior to those obtainable with cast or sintered metal. Although temperature and humidity affect "Zytel" to a greater degree than metal, experience at Du Pont Sales Service Laboratory indicates that tolerances of ±0.001 to ±0.002 inch per inch can be achieved and maintained under operating conditions normally encountered. (Specific suggestions on control of tolerances in the injection molding of "Zytel" are given in Polychemicals Department Information Bulletin No. X-38a.)



Air pressure windshield wiper motor parts molded entirely of Du Pont "Zytel". These parts, molded to required tolerances, are dimensionally stable, and need no surface refinishing before assembly. For gears molded of "Zytel" nylon resin, tolerances of ±0.002" per inch on critical dimensions can be maintained.

Frictional Couplings

(*Continued from page* 55)

torsional vibration damper, eliminating the conventional damper. Added cost economy is said to accrue from the elimination of a damper. There is the possibility that belting could be simplified by reducing the number of V-belts or reducing their size where several accessories are driven by a single coupling. Another gain from the standpoint of the operator is a consequent increase in belt life and freedom from replacement troubles.

There is another application associated primarily with passenger cars and possibly buses. We refer to the control of air conditioning system compressors (See Fig. 2). Since the major requirement is a means of off-and-on control to make the compressor inoperative except when air conditioning is called for, the company has devised a simple clutch-like mechanism which is cut out manually by means of a push-pull cable, operated by a suitable control from the dash. This removes compressor load entirely when air conditioning is not needed, without disconnecting the machine.

The layout in Fig. 2 illustrates only part of the control of an accessory drive. Here the coupling serves as a torsional vibration damper, driving the air conditioning compressor. A more comprehensive arrangement would include belting for the fan, water pump, generator and the hydraulic pump for power steering when specified. Naturally if the entire accessory drive is controlled from a single coupling as described above, the compressor would be speed-torque controlled as are the other elements, besides having the off-on manual control. The general character of the off-on clutch mechanism for the compressor also is shown in this view. It is important to note that this is not to be confused with the design of the speed-torque responsive coupling.

The design detail of the coupling may be visualized both from Fig. 1, the general form of the coupling for individual accessories, and Fig. 3 wherein the coupling also combines the functions of a damper. Looking at Fig. 3, it will be noted that the driving member (1) is a drum, contacted by a series of formed blocks of suitable friction material, conforming to the diameter of the drum. Depending upon its function, the block has two springs nested as shown in Fig. 3; or a single spring as in Fig. 1. Spring pressure is selected for each individual applica-

(*Turn to page* 116, *please*)

You can now obtain Sundstrand Automatic Lathes with tracer control for multi-cycle single point turning of irregular shapes. The lathes can be provided with a template controlled tracing slide mounted to the regular front carriage.

With this attachment and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in one automatic cycle. The control can be set up for one, two or three cycles depending on job requirements. The regular cross feeding rear slide can be used to square up shoulders, chamfer, etc. Cycle changing is quick and easy requiring only 5 to 15 minutes depending on the number of facing tools required in the job set-up.

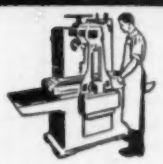
* This attachment is available for factory installation only on new Sundstrand Automatic Lathes.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

SUNDSTRAND

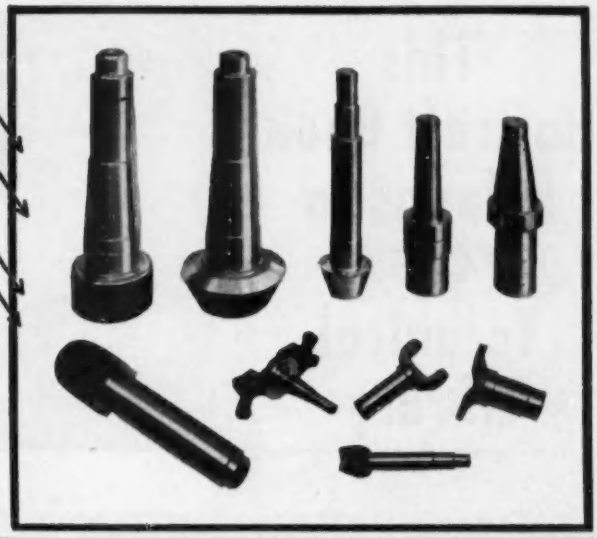
"Engineered Production" Service*

*REG. U.S. PAT. OFF.



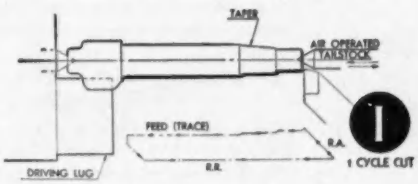
For Parts Like These

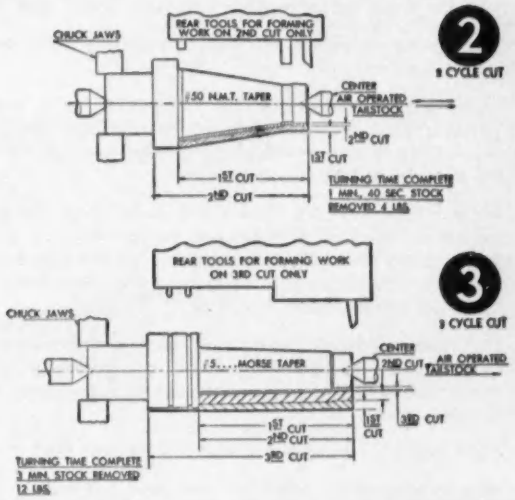
Illustrated at the right are typical parts that can be turned on a Sundstrand Automatic Lathe with the new Sundstrand Multi-Cycle Tracer Control. The pinions, stub arbors and universal joint parts illustrated are just a few of many that can be turned efficiently on this equipment. The diameters and tapers are turned with simple single point tools. Small lots or large can be handled easily and quickly.



Typical Tooling

These sketches illustrate stock removal and tooling for a one cut, two cut or three cut job. The lengths and depths of the first, second and third turning cuts and the cross feed of the rear slide are automatic and part of the machine cycle. Changing over to a different job is easily done in a matter of minutes.





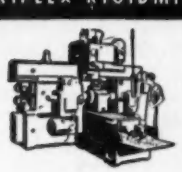
Features

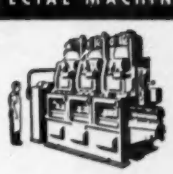
1. Easily changed over for different jobs. 2. One template for all three cuts. 3. Change-over time to standard operation approximately 45 minutes. 4. Three turning cuts in one automatic cycle. 5. Cross feeding rear slide operates in automatic cycle for facing, grooving, chamfering, etc. 6. Because of the complete automatic cycle one operator can run several machines.

Free Data

Additional information is available in this new folder. Write for your copy today. Ask for bulletin No. 248.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2571 Eleventh St. • Rockford, Ill., U.S.A.

Frictional Couplings

(*Continued from page* 113)

tion to meet the torque demand. It will be noted that centrifugal force is developed in the blocks as speed of rotation is increased. This force counteracts the force developed by the springs and these forces are so proportioned as to provide the proper degree of slippage between the blocks and pulley for the designed limiting top speed.

It will be noted further (Fig. 3) that the blocks and springs, in turn, are nested within the cage (3) and thus transmit rotation to the driving sheave of the belt system. In the arrangement described here, both (1) and (3) are in constant rotation when the engine is running while the blocks (2) are in constant contact with the drum. However, the design provides for a definite differential of relative speed of (1) and (3) depending upon operative conditions. When maximum torque is required in the entire system both elements may be rotating at the same speed. At the limiting speed of the system, (3) will be rotating at a lower speed due to the slippage of the friction blocks under decreased spring pressure. There will be situations between these extremes where the differential in speed will vary from zero to a maximum depending upon the torque requirements of individual accessories.

A noteworthy feature of the design is the provision of an integral cooling fan, as seen in Fig. 3. Air is forced into the mechanism, promoting an excellent means of dissipating heat and holding the parts to a nominal temperature range.

We understand that Lipe-Rollway is conducting experimental work for a number of manufacturers on specific applications. The company invites inquiries from readers of *Automotive Industries*.

Contract for New-Type Sub Goes to General Dynamics

General Dynamics Corp., Groton, Conn., has a new $17.8 million contract to build a fast attack-type submarine for the Navy. Displacing 1800 tons, the short-hulled sub will travel at more than 20 knots on the surface and more than 15 submerged.

The vessel will have a streamlined superstructure and breathing apparatus to permit it to remain underwater for long periods. Funds for the new vessel were provided in the Navy budget for the fiscal year which ended June 30.

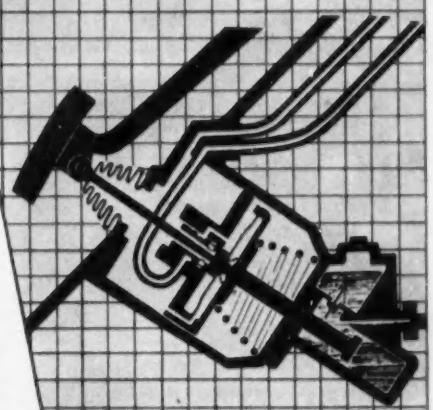
MEMO

FROM: Engineering
TO: Purchasing

Find out if Du Pont can develop a grade of "Fairprene" for the diaphragm in our new hydraulic vacuum-power brake--has to have low permanent set and drift.

Jim

P.S. Ask about weather-stripping cement, too--



DU PONT
FAIRPRENE DIAPHRAGM

AN ENGINEER NEEDS carefully engineered materials. That's why Du Pont offers to "tailor" the properties of "Fairprene"* synthetic elastic compositions to fit exactly the job you want done. Du Pont technicians are always ready to work with you to determine the specific requirements of your application. Then Du Pont will supply you with a grade of "Fairprene" that fills those requirements exactly.

The general properties of Du Pont "Fairprene" include toughness, flexibility and resistance to flex fatigue and abrasion, as well as resistance to aging from exposure to air, gasoline, kerosene and oil or grease—even at extreme temperatures. "Fairprene" comes in sheet stock, coated fabrics and adhesives. Among the many automotive uses for "Fairprene" compositions are weatherstripping cements, bearing seals, gasketing and diaphragms.

For more information—or to ask Du Pont's technical staff to work with you in applying the properties of "Fairprene" to your requirements—fill in and mail the coupon today.

DU PONT FAIRPRENE®

synthetic elastic compositions

"ENGINEERED TO DO YOUR JOB BETTER"

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

"FAIRPRENE" is Du Pont's registered trade-mark for its line of products made from synthetic elastomers available in the form of coated fabrics, sheet stocks without fabric insert and adhesives.

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division, A. I., Fairfield, Conn.

☐ I am interested in Du Pont Technical Service.

☐ Please send me further information on "Fairprene" synthetic elastic compositions.

The application(s) I am interested in for "Fairprene" compositions include:_____.

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

First International Instrument Congress

(*Continued from page 53*)

Co.; of propellers by D. G. Richards, Hamilton-Standard Div.; of aircraft by S. A. Gordon, Battelle Memorial Institute. Aircraft Component test stand designs were evaluated by E. H. C. Brown, Industrial Engineering Corp.

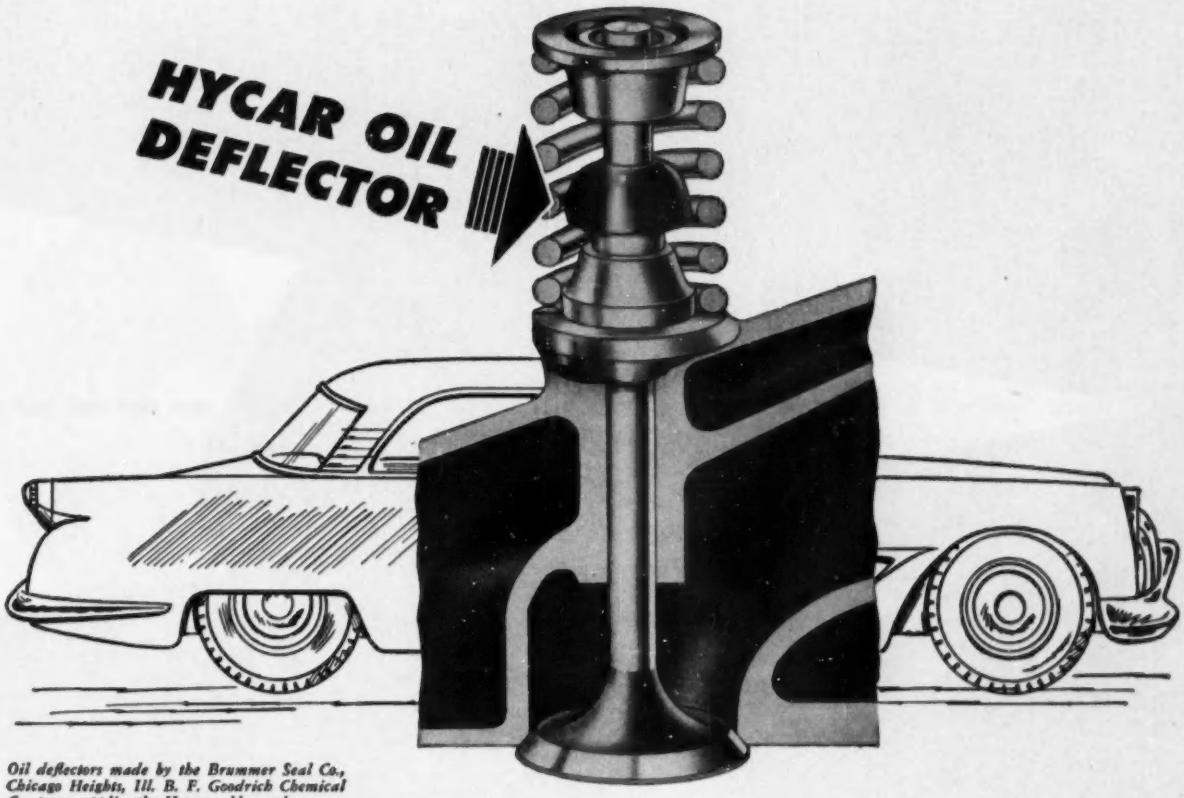
Among the many new products on display at the Exposition were: A Micro-Bore gage by American Instrument Co.; adhesive-backed metal name plates to eliminate mounting holes, by Anderson & Sons, Inc.; air pollution control devices by Bendix-Friez; a low-cost analg computer by Boeing Airplane Co.; miniature Metameter and Metagraphic recording instruments by The Bristol Co.; multi-channel oscillographs by Brush Electronics Co.; a precision pressure system and a 36 to 50-channel portable oscillograph by Consolidated Engineering Corp.; hermetically sealed aircraft switches by Control Products, Inc.; industrial TV camera by Diamond Power Specialty Corp.; Therlo glass-to-metal sealing alloy by Driver-Harris Co.; recording thermometers by Auto-Lite; Digi-Coder mechanical digital converter unit by Fischer & Porter Co.; Flexon thinwall stainless tubing by Flexonics Corp.; air bearing models by the Franklin Institute; shock-absorbing jewel systems for aircraft and automotive instruments by R. P. Gallien & Son; H-E recording controller and indicator by General Electric Co.

Other products were: Computer devices by General Mills; miniature sealed repeat cycle timers and delay relays by A. W. Haydon Co.; high-speed camera employing a new principle by Hathaway Instrument Co.; Kern Swiss strobe and rotating mirror camera for up to 100 images per second, by Karl Heitz, Inc.; stainless steel fitting for Teflon tubing by Imperial Brass Co.; analog to digital converter by Kearfott Co.; RMB roller bearings in four to 10 mm bore sizes by Landis & Gyr, Inc.; shipping container mountings and Temproof all-weather mountings for aircraft and industrial equipment by Lord Mfg. Co.; direct reading sheet steel thickness measuring instrument by Magnaflux Corp.; Hasler speed recorder for truck and bus brake testing by Matisa Equipment Corp.; illuminated push button and sealed switches by Micro Switch Div.; direct writing oscillograph by Offner Electronics, Inc.; Weld-lok socket type tube fittings for high temperature welded joints by Parker Appliance Co.; industrial TV by Radio Corp. of America; ultrasonic cleaning equipment by Raytheon Mfg. Co.

Additional products were: High speed analog to digital converter by J. B. Rea Co., Inc.; molded electronic Sealpac units and Dual-Cooled high horsepower motors by Reliance Electric & Engineering Co.; pneumatic and hydraulic valves for aircraft and industry by Revere Corp. of America; cooling controls for Diesel engines by Robertshaw-Fulton Controls Co.; 150 Series four-channel rack-mounted oscillograph by Sanborn Co.; Hi-Eff precision drilling machine by Taylor Dynamometer & Machine Co.; Varitrol control for Varidrive motors by U. S. Electrical Motors, Inc.; Series 400 controllers and Series 700 Limitrol by Wheelco Instruments Div., Barber-Colman Co.

Another new development using

B. F. Goodrich Chemical *raw materials*



Oil deflectors made by the Brummer Seal Co., Chicago Heights, Ill. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

DESIGN IMPROVEMENT IN OVERHEAD VALVE ENGINES

HERE'S an idea that eliminated a major cause of sparkplug fouling in overhead valve engines. A flexible umbrella-like part was designed that prevents oil from running down the valve stem into the combustion chamber. But one big problem was to find a material that keeps its strength and flexibility when drenched with hot oil for long periods. Hycar American rubber was the answer! It was the only material of many tested that withstood the tough operating conditions.

Molded from Hycar, the oil-wet deflectors are subject to temperatures above 200° F. during engine operation and below 0° F. in winter. The deflectors showed practically no deterioration after thousands of hours in actual road tests.

This new use for Hycar American rubber may give you an idea for solving a difficult design problem where severe operating conditions must be met. Parts made from Hycar—such as O-rings, seals, gaskets, etc.—are ideal for many applications requiring exceptional resistance to oil, abrasion and high temperature aging. For information, please write Dept. HG-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

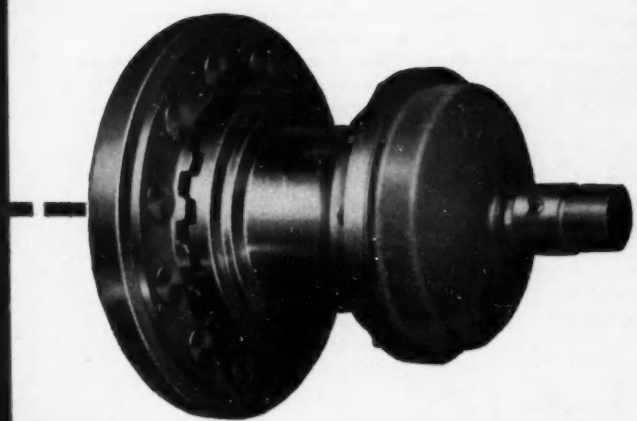
B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

IT'S HERE!

..a great, new line of inclinable presses



FEATURING
the exclusive Niagara Electro-Pneumatic Clutch

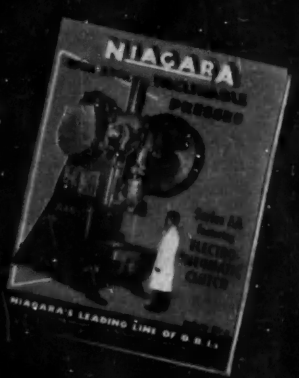
- Combines prime advantages of friction and mechanical sleeve clutches.
- Has no friction surfaces to slip, heat or wear.
- Provides a positive drive that engages or disengages instantly, at any point in stroke.
- Can be single-stroked, jogged or run continuously.
- Operates effortlessly by palm buttons or foot switch.
- Stops automatically if power or air pressure fails — an important safety feature.

Never before in O. B. I. Press history, has there been so significant a development as this new Niagara line . . . Series AA. Built in eight sizes, with shaft diameters from 3 to 7½ inches, it has set a new high for performance and stamina in blanking, forming, drawing, perforating, combination die and automatic feeding operations.

Get the complete story. Send for literature. Talk with our representative. SEE the press in action. Compare! Then, decide.

AND YOU'LL FIND ALL THE FACTS IN HERE!

BULLETIN 57-A
Sent free...promptly!



NIAGARA

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA
Dealers in principal U. S. cities and major foreign countries

National Aircraft Show

(Continued from page 61)

and fired entirely through remote control. The GE system includes the tail turret, mounting two guns, electronic computer, and radar detection equipment. GE also displayed a variety of its aircraft products, including a constant-speed alternator drive, a 1000-amp d-c generator, a 500-amp aircraft starter and cutaway exhibits of turbo pneumatic equipment.

Solar Aircraft Co. introduced its new gas-turbine-powered ground starting system. The well-known Solar "Mars" auxiliary gas-turbine power unit is used to energize the starting system of aircraft turbojet engines.

Westinghouse Electric Corp's Small Motor Division revealed its "brushless" generator for high-altitude aircraft, notably the new Convair XB-58 *Hustler* delta-wing bomber. This unit uses high-temperature rotating silicon rectifiers to replace the familiar brushes, commutators and slip rings. It is cooled by engine oil and produces 40 kva under continuous operation.

Rocket Engine Performance

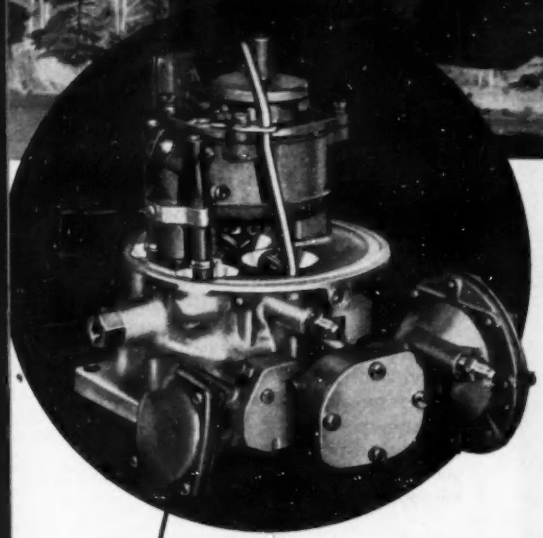
(Continued from page 71)

freed of frictional effects, slight variations in the 1 to 1 moment arm ratio, and of other effects produced by the test stand, calibration tests are run as horizontal loads are applied mechanically or hydraulically to the vertical arm through a calibrating SR-4 load cell on the center line of the rocket engine. Input load is measured by recording the output of the calibrating load cell, which is periodically dead-weight tested, and output load is recorded in the instrument room. Differences in the readings can be zeroed out on the recorder so that its direct readings in pounds will agree with the calibrating instrument readings converted to pounds.

INTERNATIONAL *Pioneers the move* TO 4-BARREL CARBURETION!

HOLLEY CHOSEN FOR POWERFUL NEW 501 ENGINE SERIES

International's most powerful new engine—the Royal Red Diamond 501 valve-in-head—is installed in the new 220 truck series. This amazing new engine delivers 201 horsepower and 430 pound-feet of torque. *It is the first production truck engine to be equipped with a 4-barrel carburetor.*



This Holley-developed 4-barrel carburetor increases both engine output and power range. It is the first 4-barrel carburetor with a built-in governor; first with vacuum controlled secondary barrels.

The secondary barrels remain closed at low engine speeds, allowing the engine to maintain satisfactory velocities and distribution. Then, as engine speed increases to a point where additional breathing capacity is needed, the vacuum controlled secondary barrels open automatically.

Working closely with International engineers, Holley designed and developed this advanced carburetor-governor combination. It is original equipment on all tractors and trucks in International's new 220 series.

If *you're* wondering how to do a job of fuel metering better and more efficiently, call Holley's Carburetor Engineers. Let them listen, test, recommend and design.

For Holley carburetor parts and service for International trucks, see your local International Harvester outlet.

HOLLEY *Carburetor Co.*

VAN DYKE, MICHIGAN

Working with Automotive Engineers to Increase Standards of Performance and Economy for More than Half a Century.

DETAILS OF J-65 TURBOJET

(*Specifications continued from page 98*)

13—Lubrication System: Type: Closed system oil mist. Tank capacity: 5 gal. Normal oil supply pressure: 20-35 psi.

14—Oil Specification: MIL-L-7808.

15—Mounting: Type: 3 point. Location of pads, points, etc.: 1 stabilizing support at front and 2 trunnions at center main bearing support horizontal centerline.

16—Starting: Type and location of starter: Electrical Starter—Generator, located at front.

17—Engine Dimensions: Diameter: 37.75 in. Length overall: 130.66 in. Frontal area: 7.75 sq. ft.

18—Weights: Dry: 2595 lb. Complete with accessories: 2696 lb.

19—Performance Ratings: 7220 lb./8300 rpm.

20—Consumption: (Restricted).

Expenditures for new plants and equipment are gradually declining during 1954. However, it will still be the second best year on record, slightly under 1953, the Securities and Exchange Commission and the Commerce Dept. report.

A new Federal agency is now open for business. It is the Advisory Committee on Highway Improvements, which will recommend to President Eisenhower measures for implementing his proposed $50-billion road building program.

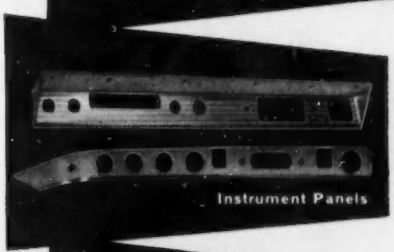
Motor vehicle registrations in the U. S. continue to gain and are expected to reach 58,129,000 for 1954, according to an estimate of the Bureau of Public Roads. Passenger cars will number 48,087,000, while trucks and buses are expected to total 10,042,000.

Legislation designed to kill automobile "bootlegging" is expected to come in Washington again next year, regardless of whether below-list price sales are still in effect or not. Backers of the "no discount" bill fear bootleg sales will crop up again, and they are pressing hard for a legislative remedy while dealer indignation is high.

Important dollar savings are being made, Defense Dept. discloses, as by-products of its continuing program for conserving critical and strategic materials. For example, the Pentagon says refinements in the production of jet engine parts by Navy contractors are estimated to be saving almost $88 million annually.

Metalworking firms will find the forms they will receive early next year for the census of manufacturing simpler, easier to fill out directly from their 1954 books than those of earlier censuses.

plan on product beauty that lasts longer . . .



PLAN ON ALUMINUM PARTS AND TRIM

The aluminum parts and trim shown here are examples of how leading automobile companies are using aluminum in their distinctive designs. Aluminum, in either its natural finish or in a wide range of special finishes, is attractive and stays attractive. It also offers light weight with great strength; freedom from rust; ease of fabrication; low cost; plus other design and functional applications that would be impractical with other materials.

Reynolds Aluminum Specialists are always ready to help on your design and production problems. Reynolds fabricating facilities are also at your service. Call the Reynolds office listed under "Aluminum" in your classified telephone directory or write Reynolds Metals Company, 2587 South Third Street, Louisville 1, Kentucky.

See "Mister Peepers", starring Wally Cox, Sundays on NBC TV

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

SHELBY SEAMLESS TUBING helps Caterpillar® build machines

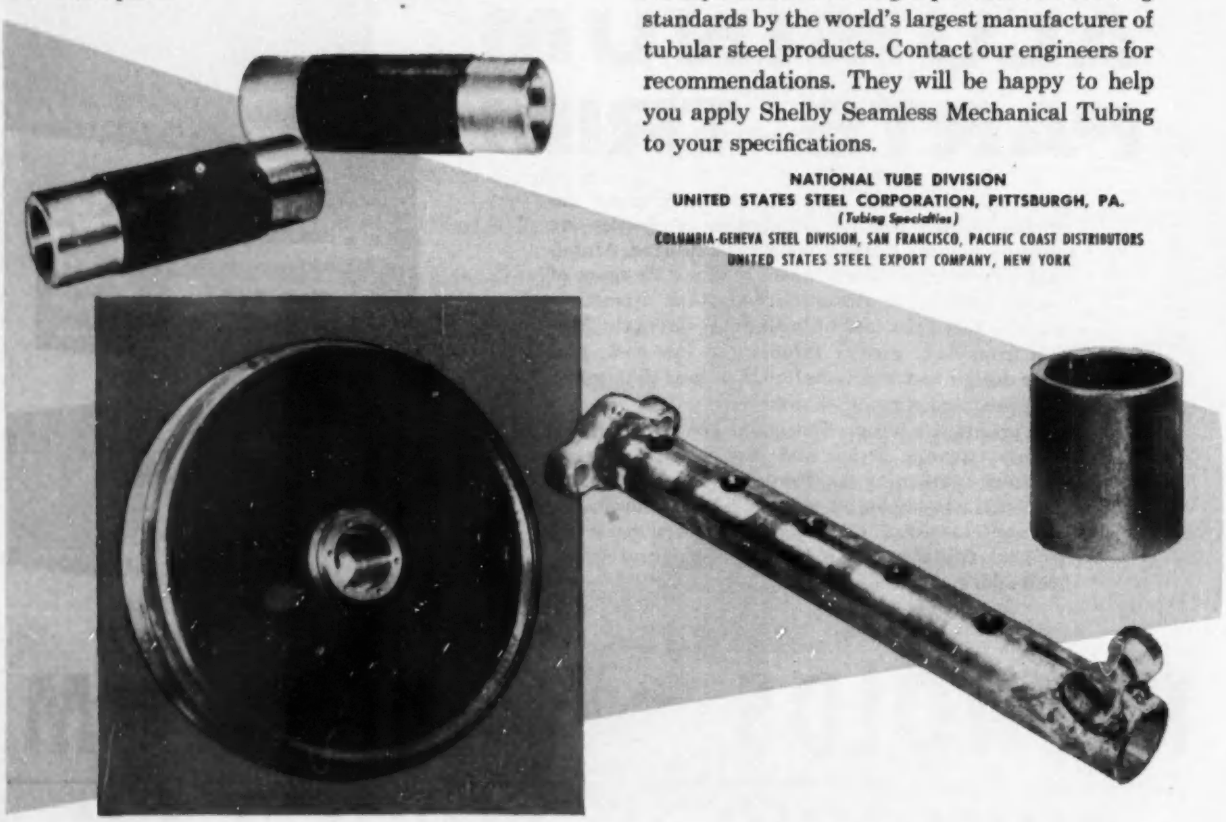
THIS year Caterpillar Tractor Co. celebrates 50 years of crawler tractor manufacture—half a century of progressive development and outstanding success. During this period, Caterpillar-built products have become world-famous for their unfailing dependability under all conditions of service.

We are proud of the fact that throughout the years Caterpillar has confidently used Shelby Seamless Tubing for many of the vital parts that keep hard-working Caterpillar-built machines on the job.

Super-rugged equipment calls for super-strong materials. That's why you'll find USS Shelby Seamless Mechanical Tubing being used for so many heavy-duty applications. Its great strength, complete uniformity, and extreme dimensional accuracy make Shelby Seamless the ideal mechanical tubing for the fabrication of machine parts subject to bruising performance and long wear.

Available in a wide range of diameters, wall thicknesses, various shapes and steel analyses, Shelby Seamless Tubing is produced to exacting standards by the world's largest manufacturer of tubular steel products. Contact our engineers for recommendations. They will be happy to help you apply Shelby Seamless Mechanical Tubing to your specifications.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



News of the MACHINERY INDUSTRIES

(*Continued from page* 80)

N. W. Dorr Co., Chicago, will be its manufacturer's agent in the Illinois area of Chicago, Rockford, and Peoria and in the South Bend, Indiana area.

Bullard Co., Bridgeport, Conn., has revealed that net income for the first six months, ended June 30, amounted to $3.9 million. Sales for this period amounted to $31.5 million. This is approximately 11 per cent below the same period 1953 and an increase of a little over one per cent for the previous six months. Backlog stands at $16 million.

Allegheny Ludlum has completed an expansion program at its Carmet Division plant in Ferndale, Mich. The new facilities make the company an integrated prime producer of cemented carbides.

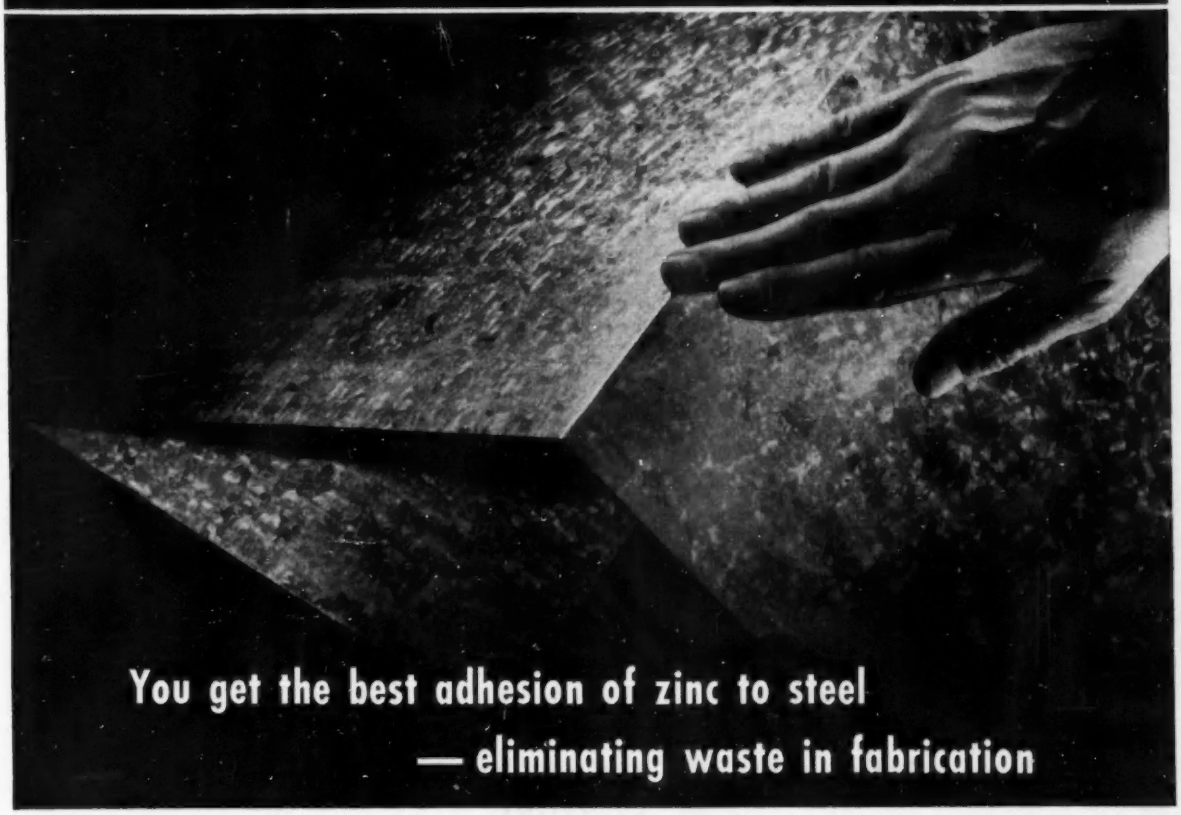
Tracer Control Co., Hazel Park, Mich., has purchased from Lodge and Shipley the contour machining duplicator for which they have been the national distributors. Tracer Control will now manufacture and sell the device which has been named the Duplimatic.

Ferguson Machine and Tool Co., following a 50 per cent increase in the production capacity of its special machinery division, has announced that it is now prepared to bid on the manufacture of specially designed machinery and components.

Peck, Stow & Wilcox Co., Southington, Conn., has adopted a program for the expansion of its machine tool division which manufactures sheet-metal working equipment. New machinery will be engineered and added to the present line.

Hydra-Feed Machine Tool Corp., South Norwalk, Conn., is working on a new line of high production automatic lathes. The machines will be completely adaptable to automation and automatic chip removal, and will provide optimum carbide performance.

WHY IT PAYS TO BUY GALVANIZED SHEETS FROM US



You get the best adhesion of zinc to steel — eliminating waste in fabrication

● USS Galvanized Steel Sheets are noted for their unusually tight protective coating of zinc that effectively resists cracking and flaking under tough fabricating operations—bending, rolling, cutting, stamping, soldering. This means a faster, better fabricating job. And these sheets are consistently uniform in ductility, flatness and surface finish.

USS Galvanized Sheets — as well as *all* the steel sheets and strip that we sell—are the well-known, always reliable products of United States Steel . . . the world's foremost manufacturer of fine steels.

Whatever your requirements for sheets or strip, of any type, it will pay to call U.S. Steel Supply. You will get fast delivery of exactly what you need from our complete stocks. In addition, we are staffed to give qualified technical asistance in helping you solve difficult application problems. And, for cutting or shearing your sheets to size, our modern equipment means closer tolerances, less scrap loss.

In addition to USS Galvanized Steel Sheets, call us for: hot rolled, cold rolled, Vitrenamel, galvannealed, paint bond, corrugated, and long terne sheets, and hot rolled and cold rolled strip.

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What you want
When you want it
At the right price

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Coast to Coast

USS STEEL — UNITED STATES STEEL

UNITED STATES STEEL

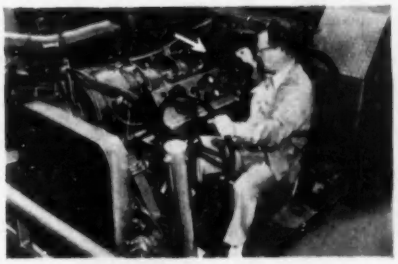
Aircraft Ignition Systems

(*Continued from page* 62)

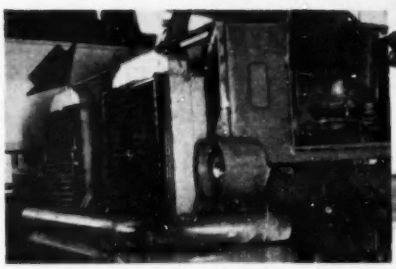
on this development stated that it requires fewer moving parts. The present problem is that there are some electrical losses through this system. When this unit is approved for production and sale, it will require a new distributor and ring manifold for current aircraft engines. In addition to these developments, Bendix is also working on shunt type ignition systems for reciprocating engines.

The next major portion of the meeting was devoted to questions presented by airline engineers concerning Scintilla equipment now in operation. American airlines questioned Scintilla regarding test equipment utilized for carbon brushes. There are, of course, a number of tests established for a product of this nature, such as spectograph, density, porosity, ash content, hardness. It was pointed out, however, that the test seemed to have no bearing whatsoever on how well a brush wears in actual service. The erratic behavior, it was claimed, is due more to the type of installation and operating conditions.

Major discussion between the airlines and Scintilla personnel developed around the new graphitized distributor plates and distributor finger. Operators wanted to know whether they would reduce brush wear and plate wear any appreciable amount. These units, which have just been put into production, are said to greatly improve the service life of both Bendix brushes and plates. Bendix recommends graphitizing the distributor blocks and plates and suggests to operators that old plates be graphitized at the next overhaul period. The procedure recommended is to first refinish the distributor and collector plates and then to vapor blast the parts. After the plates or blocks are thoroughly cleaned to insure that no grit remains on the surface, the graphite should be applied by turning the parts over a rubber pad that has been impregnated with graphite. To prevent build up of the graphite in



Here's the LOW DOWN on HIGH HEAT TRANSFER



High climbs up five miles or more of rugged road to the rim of an open-pit copper mine . . . with a 75-ton payload . . . generates lots of heat. When the Dart Truck Company built the giant 12-wheeled, 96,000 pound, truck for Bagdad Copper Mines, the design required the finest radiators and heat transfer products obtainable. As a result, Young Heat Exchangers and Young "Mono-Weld" Radiators were selected to do the cooling job. On Dart's 275 HP Underground Truck, Young was again specified.

Such is the story throughout many industries . . . wherever optimum engine cooling is required along with superior construction for rugged service. Whatever *your* heat transfer problem may be, take it up with a Young Sales Engineer. He will recommend a specific unit or combination of units to meet your specialized needs without obligation to you.

DART MOTOR Selects YOUNG Radiators and Exchangers

Top photo: "Aardvark" made by Dart for underground work. Only 60 inches high and fully reversing, it is ideal for work in mine tunnels. Conveyor discharges from 0 to 60 feet per minute. *Inset top:* Operator's "Office" puts all instruments and controls in easy reach. Excellent vision is possible in either direction. *Lower left photo:* Inset shows two Young Standard-type "Mono-Weld," welded steel, Radiators which cool 350 hp Diesel engine of the Dart 60 Truck shown alongside. Two Young Type "F" Heat Exchangers are used to cool the fluid for the twin torque converters.

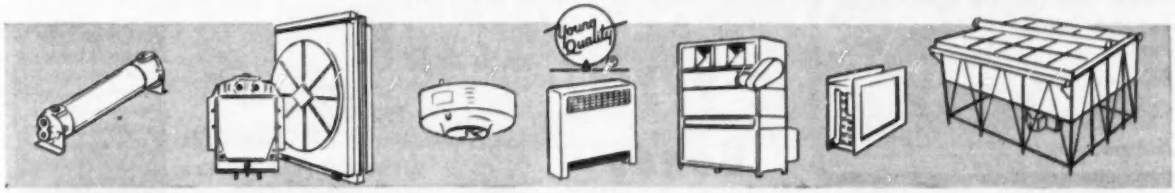
Write for further details or catalogs, without obligation.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 104K, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.



Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

slots between segments, an occasional air blast is recommended. It was also suggested by one of the airline operators that the collector and segment plates be metal sprayed, but Bendix, as well as the other airline operators present, had no experience with this practice.

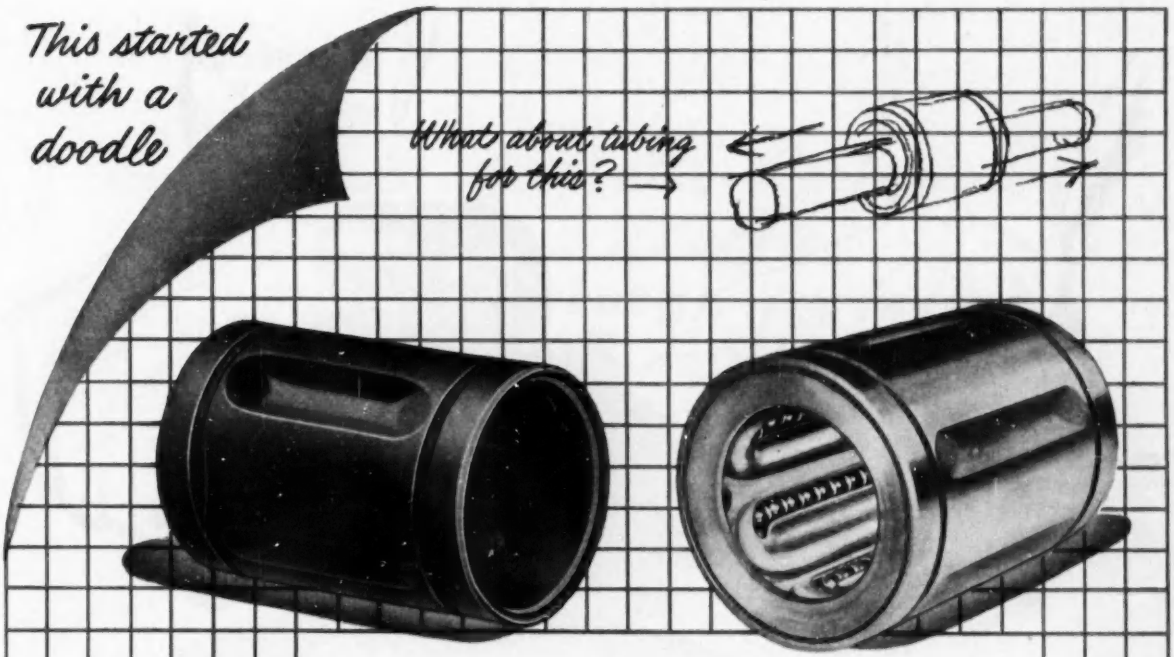
There was a great deal of discussion concerning a manual spark advance being installed by several airlines for R2800 engines. A Pratt & Whitney representative stated that with a manual spark advance a two per cent saving in fuel economy can be obtained and a four per cent additional saving for the 12 bmep drop can be obtained when using the spark advance. It is recommended that the manual advance be used only up to 1100 hp in low blower and 1000 hp in high blower. It was suggested that airlines wishing to install this system should check with the manufacturer and current users for their experience to avoid some of the problems associated with the spark advance.

During the course of the meeting, the Bendix ignition analyzer was brought to attention many times, and Scintilla distributed a booklet on wave form interpretation for R2800 low tension ignition systems.

Conferences of this type between the operators and the manufacturers have been highly successful in the aircraft industry. It gives the operator a chance to air his problems openly and to find out what the manufacturer is doing to correct them or possibly what other airlines have done to correct the situation. At the same time, the manufacturer learns of new problems, possibly new solutions, and is given an opportunity to tell the operator what is being done to solve current problems and what is being worked on for future application.

This started with a doodle

What about tubing for this?



Precision Tubing for Precision Jobs

Tubing tolerance is a big "must" on this job. Thomson Industries, Manhasset, N.Y., insists on it. Otherwise, manufacturing BALL BUSHINGS (ball bearings for linear motion) would have been even tougher than it was.

Part of the problem was the tubing to house the bearings and the raceway. Those bearings are very tough on tubing . . . especially at the contact points.

Other requirements were: good surface conditions; good dimensional control, both I.D. and O.D.; uniform wall thickness; uniform concentricity; and uniformity from a metallurgical standpoint to stand heat treating.

And, equally important, economy. By using ELECTRUNITE Tubing, Thomson Industries eliminates a grinding operation. That helps keep costs down.

The tubing that has all these advantages is Republic ELECTRUNITE, a *precision* mechanical tubing for applications like this. You can get it in carbon or stainless analyses. And Republic engineers will be glad to help you use it, profitably, in whatever products you make. Call your nearest Republic Sales Office or write to:

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REPUBLIC ELECTRUNITE TUBING

REPUBLIC STEEL

New lightweight grinder is a HEAVYWEIGHT WORKER!

Why weigh down an operator with a heavier grinder? Put a new 7 pound air-powered CP Vertical Grinder in his hands and he'll remove the same amount of metal as he formerly did with a 10 pound tool!

Designed for driving cup wire brushes and grinding wheels, sanding discs, and cut-off wheels, the CP-3190 is tops for its handling ease and versatility. The features below explain why the CP-3190 takes the constant beating of heavy industrial usage with minimum maintenance:

- **Splined type floating rotor to prevent end-plate wear from wheel thrust.**
- **Continuous lubrication is afforded by large oil reservoir and built-in lubricator.**
- **Safety governor valve cuts off air supply in the event of possible governor failure.**

Available in speeds up to 8000 RPM and in capacities capable of handling 6" cup wheels, and 7" and 9" disc sanding pads and cut-off wheels. For more information write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

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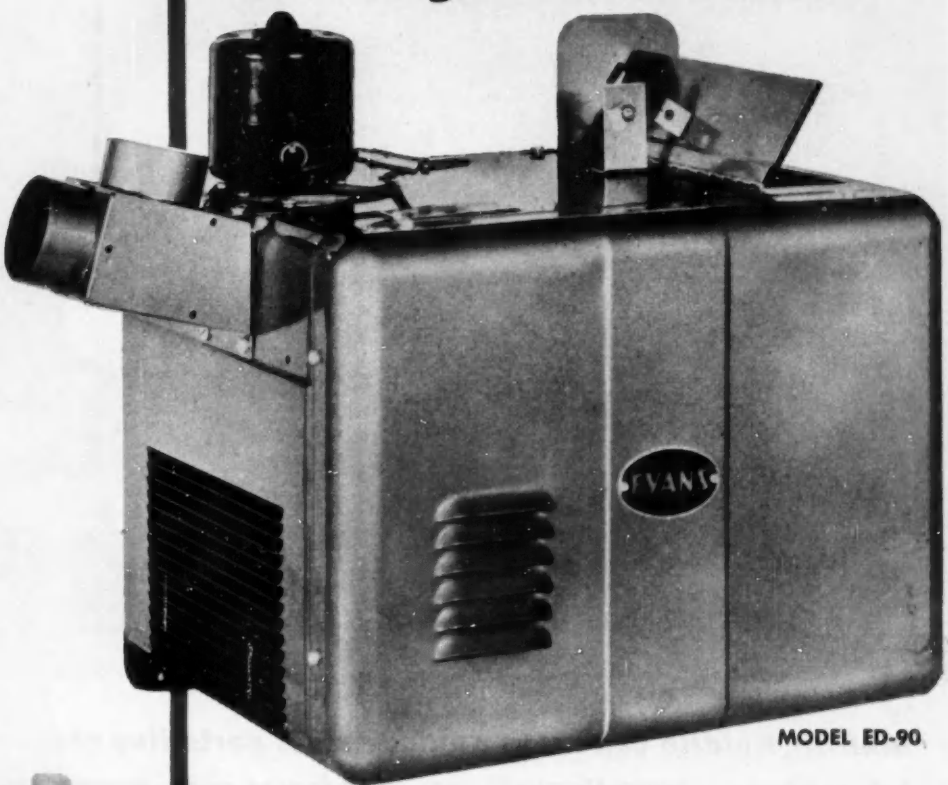
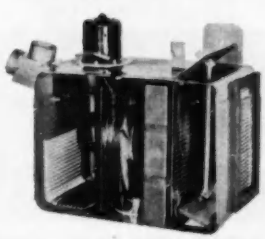
a new heater defroster

specially designed by EVANS for large truck cabs



MODEL ED-90



Removing front cover exposes all elements for easy servicing. Note the exclusive Evanair 9" Die-cast fan, the interlocked dampers for mixing recirculated and fresh air, the extra thick 2" core, the built-in high pressure blower with extra large motor and the over-all heavy duty construction.

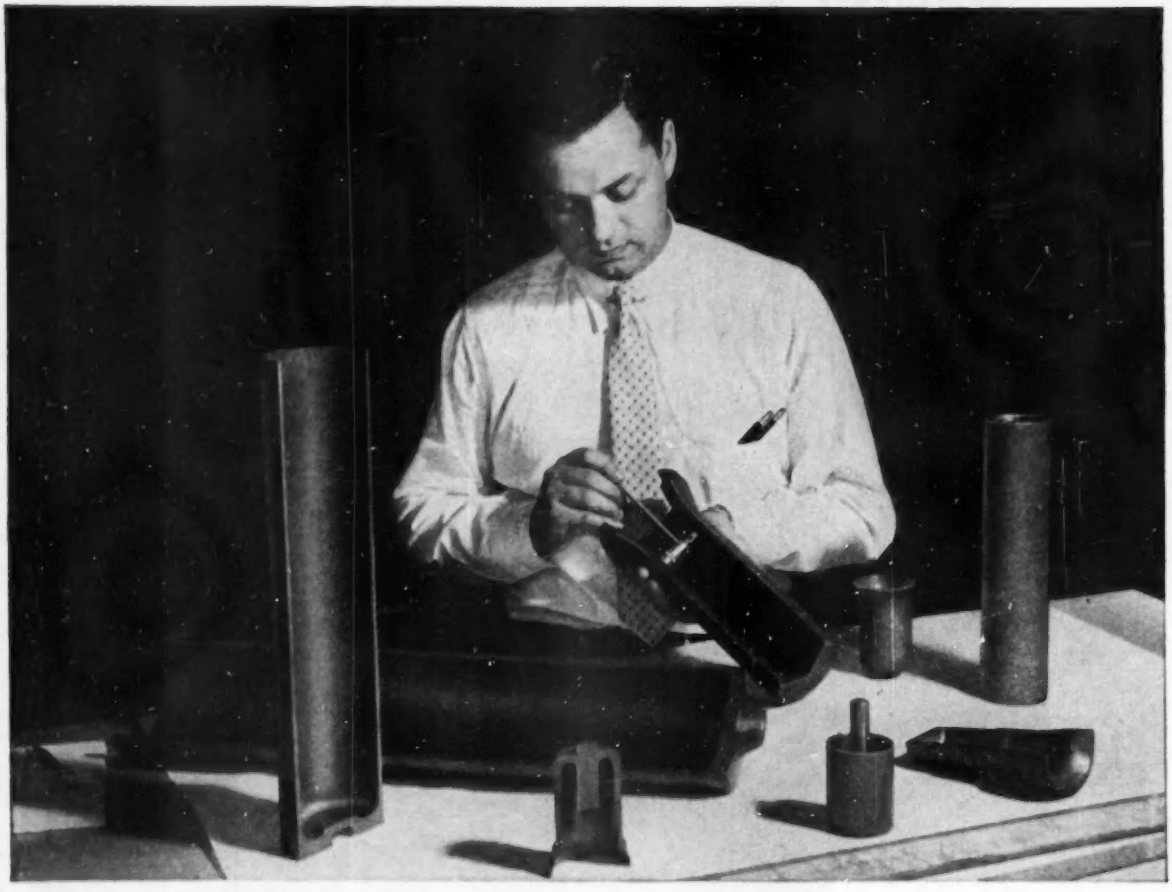
- 100% fresh air or mixed with recirculated air as driver desires
- Powerful built-in pressure type defroster blower 72.2 CFM of hot air at windshield
- Controlled summer comfort, 100% fresh air with water shut off
- Balanced heat distribution to cab floor, driver and helper
- Pressurized heating and ventilating when set for all fresh air
- Plus all these Evans standard features: Distinctive Styling, Compact Design, Modern Appearance, Built-in Durability, High Efficiency, Engineered-to-match motors, fans and cores, Easily Accessible Components, Full-Year (or 50,000 mile) Warranty.

For further information on Evans heaters or expert engineering advice on any truck or bus heating and ventilating problem, write Evans Products Company, Dept. P-10, Plymouth, Michigan.

EVANS ... *BALANCED HEATING & VENTILATING SYSTEMS FOR EVERY TRUCK AND BUS* ...

REGIONAL REPRESENTATIVES: CLEVELAND, FRANK A. CHASE • CHICAGO, R. A. LENNOX CO., INC. • DETROIT, CHAS F. MURRAY SALES CO. • ALLENTOWN, PA., P. R. WEIDNER

Extruded to finished dimensions!



Mullins Koldflo can mass produce steel parts like these with close tolerances . . . smooth surfaces . . . at lower cost

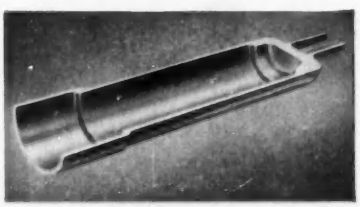
THESE one-piece parts are cold-extruded to precision dimensions, with no machining, grinding, or honing required. Thus, in volume quantities, the Mullins Koldflo* process can produce at far lower cost than other methods.

Mullins Koldflo permits you to design intricate cylindrical parts the way you want them. Design features such as shoulders, recesses, studs, etc., can usually be provided easily.

*Trade Mark

Let us quote on *your* parts . . . simply give us design details and specifications, and your quantity requirements.

Write or call the nearest Mullins office for engineering information. For copy of new booklet "How would you tool-up to make an egg?", write Koldflo Division, Mullins Manufacturing Corporation, Salem, Ohio.



SPECIFICATIONS OF TYPICAL KOLDFLO EXTRUSION
Tractor power steering cylinder, length 16⅝ in. Diameter 2.813 in., held to −.000 + .002 in. Surface finish 60 microinches or better.

Koldflo
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MULLINS MANUFACTURING CORPORATION
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Phone – Edgewood 7-8771

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332 South Michigan Avenue
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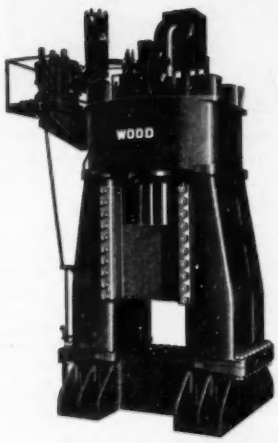
How long are nine lives?



IN METALWORKING, THE PAYOFF'S AT AN R. D. WOOD PRESS LIKE THIS ONE!

This 3,000-ton hydraulic press is designed specifically for high-speed, heavy-duty die forging and ingot cogging. R. D. Wood presses are made for many uses, and in various sizes to suit production requirements. Ask for informative catalog, and for engineering aid—both yours without obligation.

The amazing ability of cats to survive what might be called "punishing service conditions" has given rise to the 9-life theory. How long a period this is nobody really knows. That's the way it is with R. D. Wood hydraulic presses . . . their life seems limitless, too. Some of them are scarcely beginning to draw their second wind after 25 years in service. Others are still going strong at 50. What every owner knows for certain about his R. D. Wood presses is that they have no trouble outliving the time needed to earn the original investment . . . and then some. An informative catalog is available.

R. D. WOOD COMPANY

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MAKERS OF HYDRAULIC PRESSES AND VALVES

FIRE HYDRANTS

CAST-IRON PIPE

GATE VALVES

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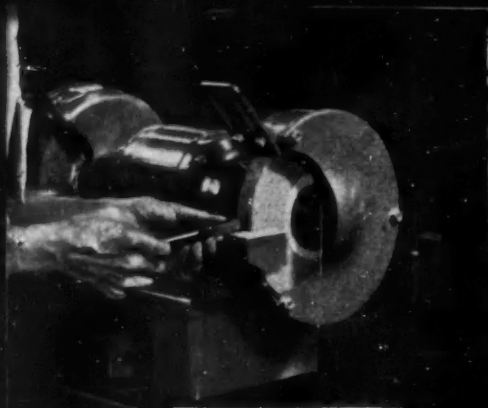
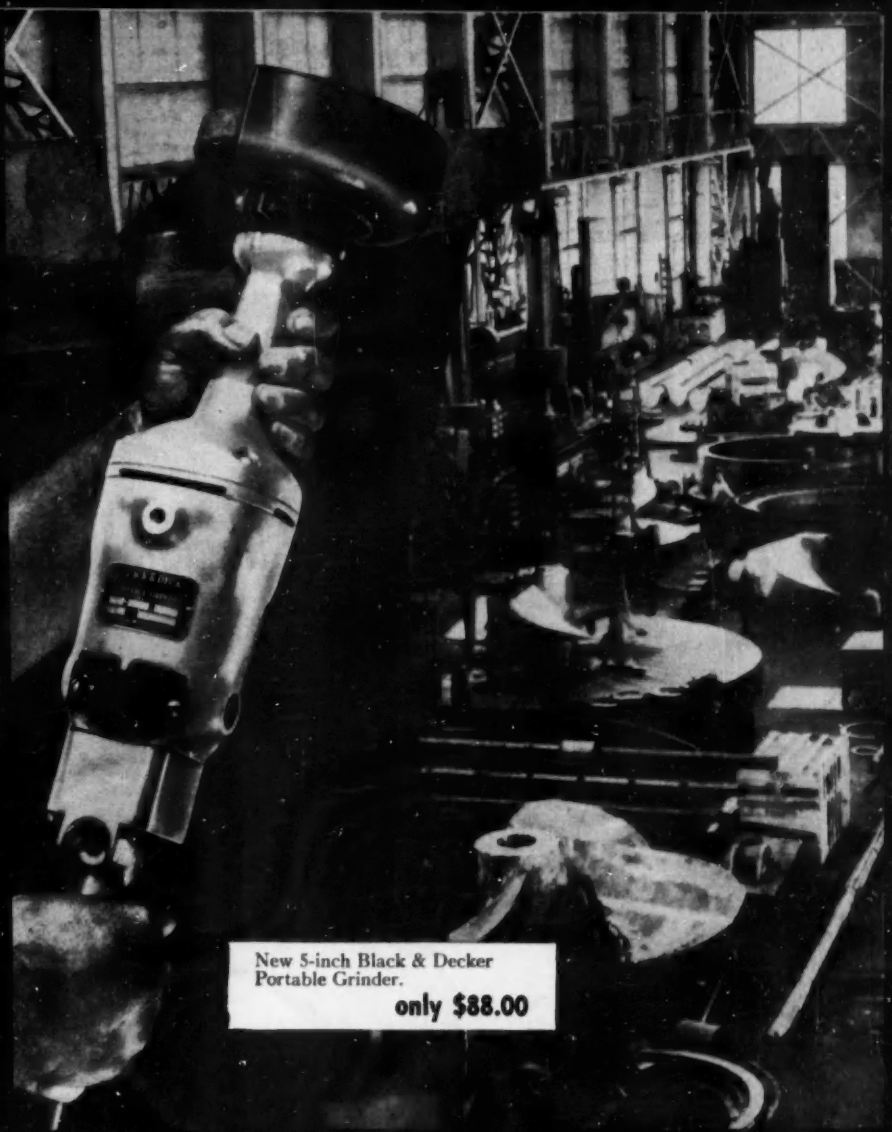


Keep tools sharp. Spot B&D Bench Grinders around your shop. Four models.
from $49.50

No. 8 Die Grinder weighs only 2-⅛ pounds. For continuous production operation.
only $85.00



New 5-inch Black & Decker Portable Grinder.
only $88.00

New 7-inch Heavy-Duty Sander-Grinder has 90% more power.
only $79.50

NOW 20% less weight
25% MORE GRINDING POWER
with new B&D Portable Grinder

Now you can reduce fatigue, do grinding jobs faster, more accurately than ever before with this new Black & Decker Grinder. 4500 RPM. Splined gear mountings. Full-size ball bearings to insure long life. B&D-built motor designed *just* for this tool. Housing designed to prevent clogging by dirt and grit. Air exhaust directed away from operator. Use it to do a multitude of jobs around your plant or shop. See this new grinder (and the other grinders shown on this page) demonstrated at your B&D distributor. Also write for further information. THE BLACK & DECKER MFG. CO., Dept. 606, Towson 4, Md.

For nearest distributor, see "Tools-Electric"

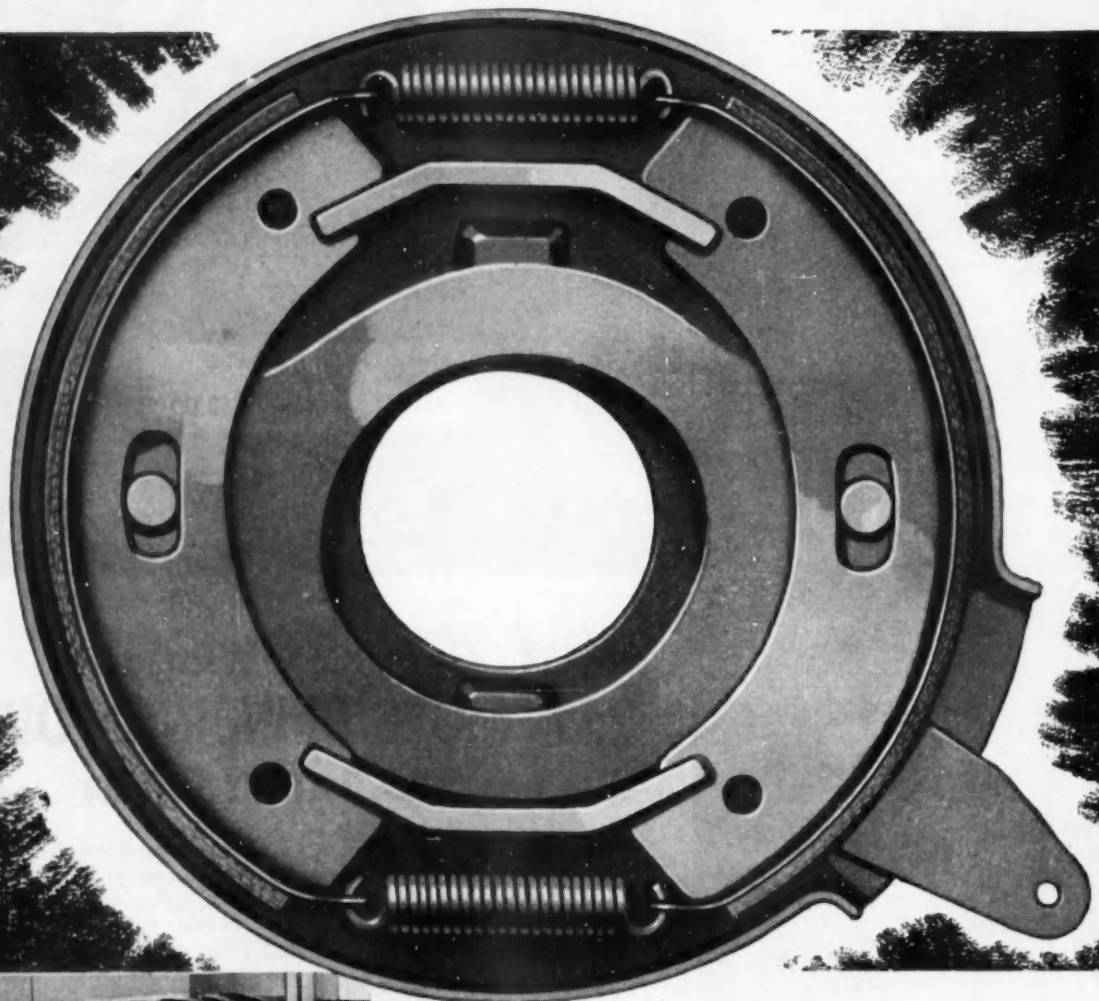
LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

FROM THE ENGINEERING
A REVOLUTIONARY NEW

For trucks, trailers, hoists, tractors, harvesters, cranes, buses,



Pre-proved in "Torture Tests"

Here's where TDA brakes are run through exhaustive tests on brake dynamometers in the world's most exacting "Torture Chamber." New materials and design features are constantly being tested and developed for use in every type of product. Also, field tests are performed on all types of brake applications under every conceivable operating condition.

"KNOW-HOW" OF T.D.A. ALL-PURPOSE BRAKE!

shovels, mixers, machinery, etc.

THIS BRAKE ALONE OFFERS YOU THESE 7 ADVANTAGES!

1 **NEW SIMPLICITY!** Only 8 simple parts. Shoes and springs are completely interchangeable. For instance – brake shoes can be "slapped in." Position of the shoes makes no difference . . . it's *impossible* to install them incorrectly. Simplifies stocking – only 6 different parts required to completely replace the brake.

2 **NO LUBRICATION REQUIRED!** Maintenance reduced to the absolute minimum. No skilled help needed because it's "fool proof" to service and install. No inside adjustment necessary.

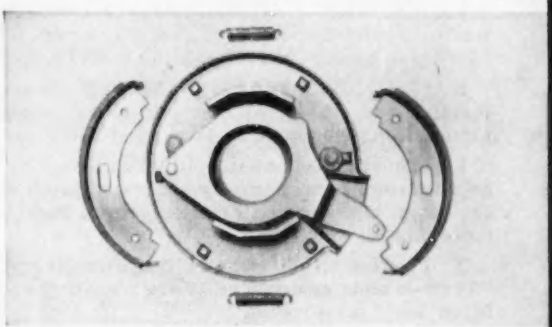
3 **ENCLOSED DESIGN** – protects against dust, dirt, water, contamination. Prolongs brake life, reduces fire hazard.

4 **LIGHTEST WEIGHT!** This new development by TDA is in a class by itself. For example: the 13-inch drum size weighs only 40 lbs. as against 80 lbs. for an ordinary band brake!

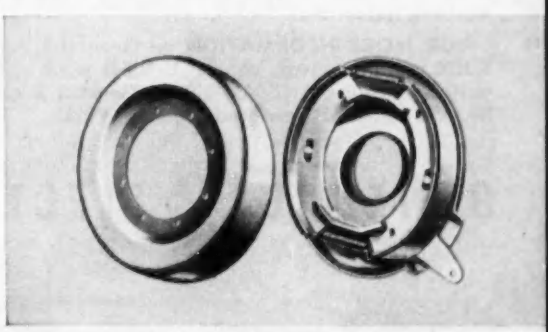
5 **LESS COST!** These brakes use lightweight stamped steel shoes of new design as against ordinary heavy, more costly cast shoes. Wear longer with increased braking power.

6 **NEW BALANCED-TYPE DESIGN!** Exerts equal torque – in both directions. Balanced pressure makes both shoes do same amount of work. Brake linings have uniform wear pattern . . . constant, smooth performance.

7 **FIVE TIMES LONGER BRAKE LINING WEAR,** proved in actual road and work tests. This means less maintenance costs for operators . . . less inventory to stock. For instance: one manufacturer plans to use *three* of these new brakes to replace *five* types now employed.



Look how simple it is! No tricky assembly. Just remove two springs and lift out shoes. Anyone can put it together in minutes. No adjustment of brake required.



Here's the combination that gives this brake its outstanding superiority. Fewer parts to wear, to stock—longer life —less maintenance—lower cost.

The result of 50 years of Timken-Detroit engineering experience . . . available in all sizes, for any type of work.

If somewhere in your business there is a special braking problem, big or small, we urge you to call on the ingenuity and vast knowledge of TDA engineers to solve it quickly – at low cost and without obligation. An inquiry on your company letterhead will receive immediate attention. Take advantage of this money-saving service now. Just write Timken-Detroit Brake Division, Ashtabula, Ohio.

TIMKEN *Detroit* BRAKES

TIMKEN DETROIT BRAKE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
ASHTABULA OHIO

The Accepted T D A Standard

TRADE MARK REGISTERED

New General Electric heavy-duty press motor requires less maintenance, reduces downtime

NEW VENTILATION SYSTEM, RUGGED CONSTRUCTION ASSURE LONGER LIFE WITH G-E TOTALLY ENCLOSED MOTOR

The new General Electric Type KRX induction motor, designed specifically for punch presses, requires less maintenance and no troublesome accessories. Because the KRX is a true totally enclosed fan-cooled motor, there are no filters to change or clean, no separate blowers necessary. You can install it and forget it!

BUILT TO GIVE YEARS OF SERVICE without major maintenance, this motor is industry's toughest press motor. Longer motor life is assured for three reasons:

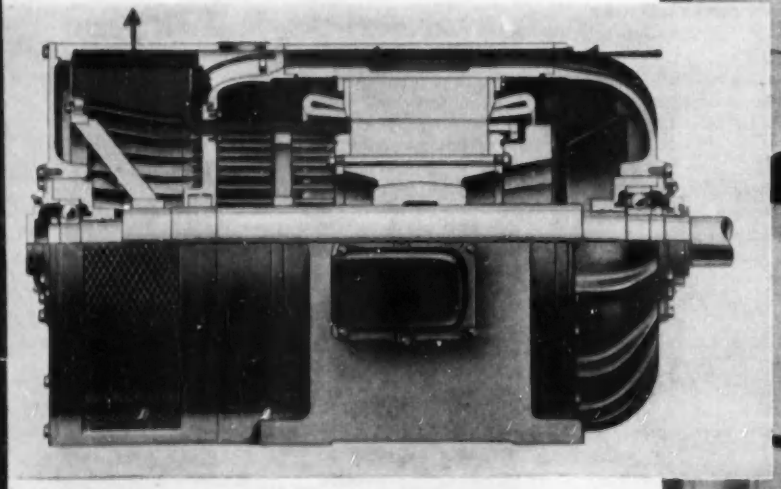
1 Insulation is less susceptible to damage by overload because rotor heat, normally generated inside the motor enclosure, is dissipated externally by a highly-effective radial fan.

2 Positive totally enclosed construction and rotating labyrinth seals protect the motor from dirt and the oil-laden air of press rooms.

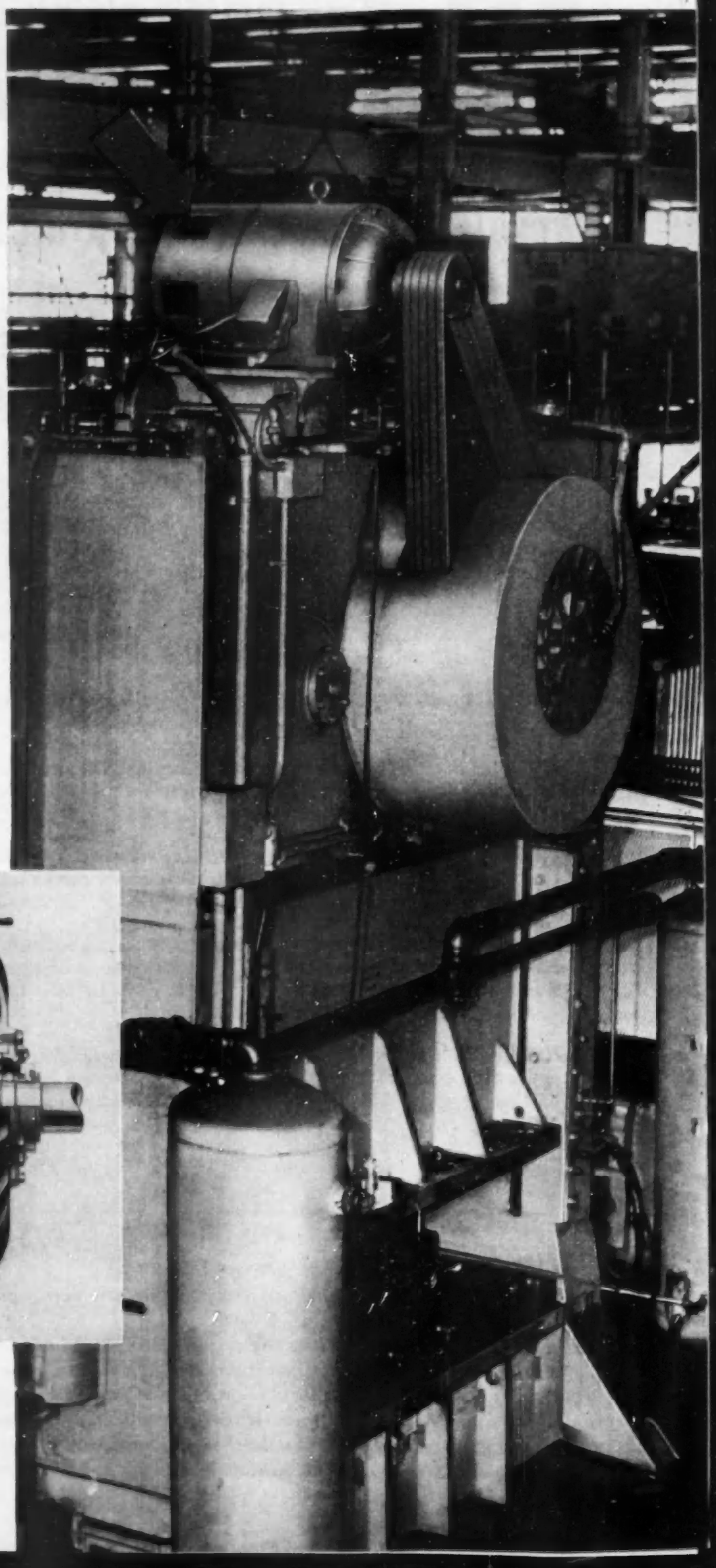
3 Rugged one-piece, cast-iron frame, rigidly bolted end shields, and sturdy rotor construction provide protection against the shock, vibration, and abuse encountered in press work in the automotive and metal-working industries.

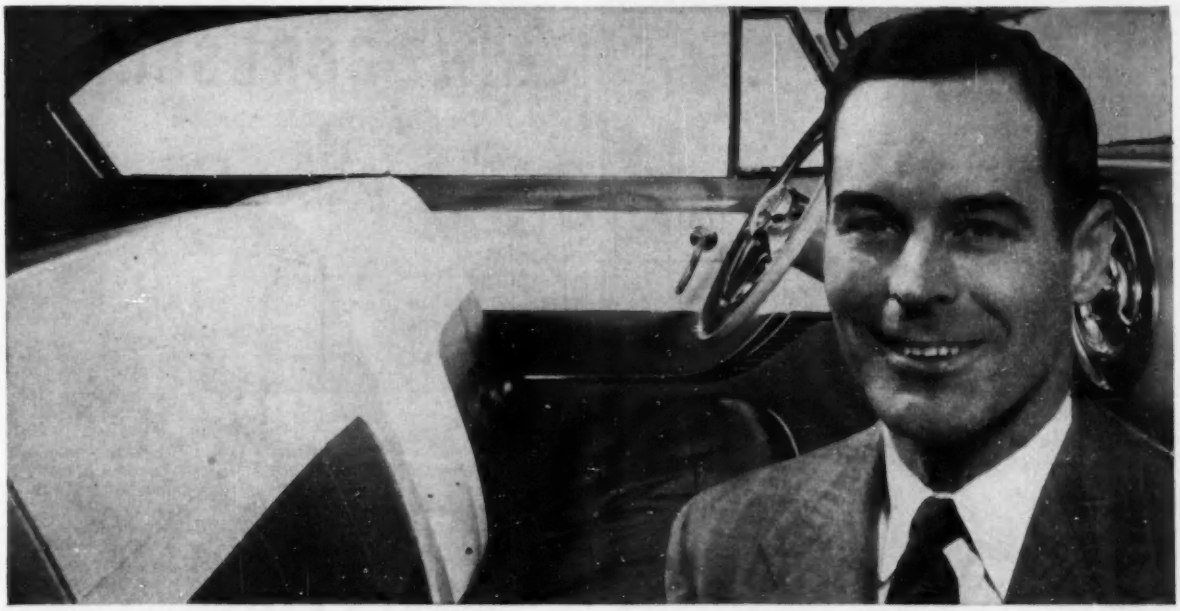
FOR MORE INFORMATION on General Electric Type KRX motors consult your G-E Sales representative, or write for Bulletin GEA-5968 to General Electric Co., Section 830-10, Schenectady 5, New York.

GENERAL ELECTRIC



EFFECTIVE COOLING SYSTEM of KRX motor is indicated by arrows showing passage of air across motor and fan blades. Bulk of rotor heat is built up in external fan ***outside*** stator assembly.





genuine Leather

gives a better buy to buyers ...a bigger profit to you

● One of the best sales features a car can have —in *any* price class—is upholstery of genuine leather. No other material adds so much extra value to a car for so little . . . or offers so much added profit for you.

Genuine upholstery leather costs little more than good seat covers . . . takes hard wear in stride and actually *improves* with age. It's the ideal car upholstery because it is always easy to "slide" on, resists hot sunlight and bad weather, holds its color and beauty for years without fading. Leather is always comfortable —becomes softer and more pliant with age— develops a rich patina that distinguishes it from any substitute. And genuine upholstery leather means a higher trade-in value. Sales reports show that it increases the resale value of any car. Nothing adds luxury, value and profit to a car like leather. Why sell less?

SEND FOR THIS FREE BOOKLET

"All About Genuine Upholstery Leather," the new, free fact-booklet on leather is yours for the asking. It contains some interesting reasons why genuine upholstery leather is the best buy for your customers—best buy for you. Write for it today. There's no obligation.

Only Genuine Upholstery Leather Wears as Well as It Looks

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- THE ASHTABULA HIDE & LEATHER CO., Ashtabula, Ohio
- BLANCHARD BRO. & LANE, Newark, N. J.
- EAGLE-OTTAWA LEATHER CO., Grand Haven, Mich.
- GARDEN STATE TANNING, INC., Pine Grove, Pa.
- GOOD BROS. LEATHER CO., Newark, N. J.
- THE LACKAWANNA LEATHER CO., Hackettstown, N. J.
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- Suppliers of finished leather.

THE UPHOLSTERY LEATHER GROUP, INC.

141 East 44th Street, New York 17, N. Y.
Detroit Office, 199 Pierce St., Birmingham, Mich.

Please send me your new booklet "All About Genuine Upholstery Leather." No obligation of course.

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Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert

When Should Alloy Steels Be Ordered to Hardenability?

This is the fifth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

What is hardenability and how does it differ in carbon and alloy steels?

Hardenability can be defined as the capacity of steel to develop a desired degree of hardness, usually measured in depth. It is produced by special heating and cooling. Carbon steel, except in small sections, will normally harden to a depth slightly below its surface, while alloy steel can, under certain conditions, harden uniformly through its entire cross-section.

Surface hardness obtainable after quenching is largely a function of the carbon content of the steel. Depth hardness, on the other hand, is the result of alloying elements and grain size, in addition to the carbon present in the steel.

In general, where hardenability is the prime consideration, it is not too important which alloy steel is used, just as long as there is sufficient carbon present to give the prescribed hardness, and enough alloying elements to quench out the section. We might mention here that it is not considered good practice to alloy a small section excessively, since too free a use of alloying elements adds little to the properties and can, in some instances, induce susceptibility to quenching cracks.

There are, of course, numerous cases where factors other than hardenability must be considered; such factors as low-temperature impact, heavy shock, creep-resistance, and the ability to resist temper brittleness. Through-hardening, therefore, is not always desirable. For example, shallow hardening is often necessary in shock applications, because a moderately soft core is essential.

Our metallurgists will gladly explain where it is advantageous to order alloy steels to hardenability, and where it is preferable to order by analysis. They will also give you any help you may require in connection with heat-treating and machining problems.

And when in need of steels, remember that Bethlehem manufactures the entire range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades. We can meet your needs promptly.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL

Sensational Piston Performance

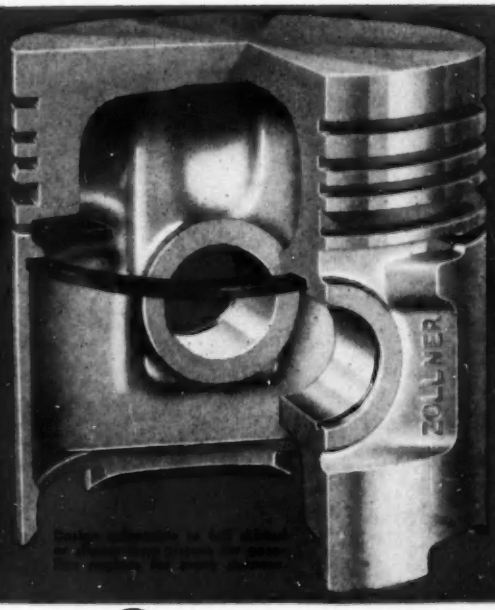
UNIFORM CLEARANCE AT ALL TEMPERATURES

STEEL TENSION MEMBER

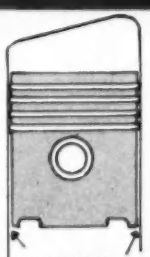
Anchored only at pin bosses and cast in positive contact with I. D. of piston skirt

Controls Clearance Automatically

ZOLLNER CLEAR-O-MATIC PISTONS



Now, pistons may be fitted to closer clearances than ever before possible. The sensational development of CLEAR-O-MATIC Pistons by Zollner engineers *reduces required clearance to less than .001 with constant uniformity of skirt bearing over the entire temperature range.* Performance results are spectacular. Engines run quietly with no cold slap. Friction is reduced without loss of durability or heat conductivity. There is no danger of scuffing or seizing. The Zollner designed steel tension member incorporates in the aluminum piston the same effective expansion as the ferrous cylinder itself. We urge your immediate test of these sensational advantages for your engine.



UNIFORM EFFECTIVE SKIRT CLEARANCE AT ALL TEMPERATURES

1. Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
2. Effective expansion identical with ferrous cylinder.
3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
5. Durability and conductivity comparable to heavy duty design.

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER MACHINE WORKS • Fort Wayne, Indiana

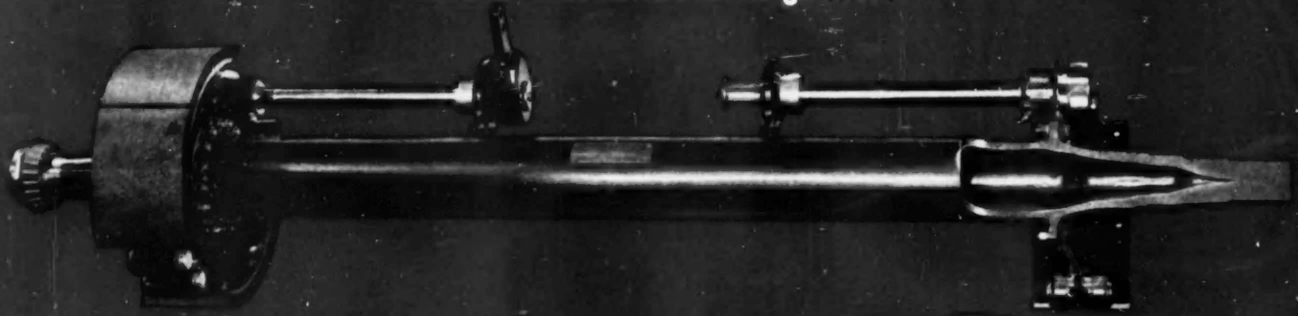
ADVANCED ENGINEERING

PRECISION PRODUCTION

in cooperation with engine builders

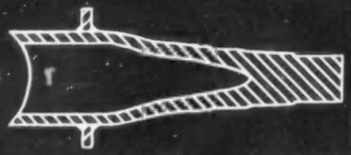
SHULER *One-Piece* DESIGN means LESS WEIGHT • • • MORE STRENGTH!

Even including their permanent (malleable-iron) brake shoes, Shuler Tubular Axles weigh less!



THERE is only one way in the world to manufacture tubular axles *for maximum strength and minimum weight* — and that's to use one-piece design, with the ends forged down like this:

SHULER METHOD



Any *other* design requires welded joints, plus heavy amounts of unnecessary metal that add no strength.

Because of the weight saved by one-piece design, Shuler can use *permanent, dependable, malleable-iron brake shoes* instead of pressed-steel shoes — and still not exceed the over-all weight of competitive assemblies.

Use the coupon to get all the facts. You'll discover why more and more automotive-equipment manufacturers are specifying Shuler One-Piece Tubular Axles.

NEW MODELS INCLUDE:

1 New light-weight but permanent malleable brake shoes and spiders.

2 Roller shafts are fitted into the shoes with precision-machining, to insure full bearing, and are then locked in place. *They can't fall out.*

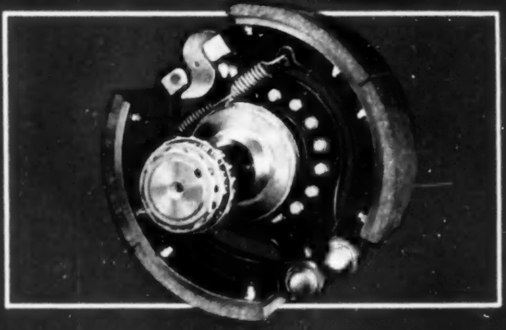
3 Positive locking "roll pins" in the anchor pins.

4 Parkerized and hardened cam rollers for rust-proofing and long service.

5 Nylon inner and outer cam-shaft bushings.

6 Self-aligning "ball and socket" aluminum cam-shaft housing.

NEW HEAVY-DUTY U-TYPE BRAKE DESIGNED ESPECIALLY FOR THE WEST COAST. Has longer anchor pins with double bearing surface, and larger-diameter cam rollers, to insure longer life under unusually severe service.



These thicker, better, REPLACEABLE linings can NEVER PULL OFF

One inspection will show you why Shuler brake linings never *pull off* — they're bolted, and how! Other advantages:

1 Uniform brake-lining wear is insured by precision-machining of the brake-shoe contours.

2 Brake linings are full ⅜″ thick, all around — not just at the center.

3 The malleable brake shoes are permanent. They do not distort as the linings wear down. When linings wear out, you just bolt on new linings.

4 Additional lining area is provided by covering the entire length of the brake shoe, and by plugging all 32 bolt holes with friction material, at the factory. Easy to do on replacements, too.

SHULER AXLE COMPANY, Incorporated, **LOUISVILLE, KENTUCKY**
SUBSIDIARY OF FULLER MANUFACTURING COMPANY
SALES OFFICES in DETROIT, CHICAGO, OAKLAND and FORT WORTH

WEST COAST WAREHOUSE
Oakland, California

SOUTHWEST WAREHOUSE
Fort Worth, Texas

Shuler Axle Company
2920 Second Street, Louisville, Kentucky
Gentlemen:
Without obligation, please send me your brochure on Shuler One-Piece Trailer Axles.

Name ______________________

Firm ______________________

Address ______________________